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UTOPIA DC INVERTER RASC SERIES
RASC-H(V)RNE

Service manual

- RASC-(3/5)HVRNE
- RASC-10HRNE

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Contents

Model codes and description 0
Units installation 1
Piping installation 2
Electrical wiring 3
Control system 4
Available optional functions 5
Test run 6
Troubleshooting 7
Spare parts 8
Servicing 9
Main parts 10
Field work instruction 11

0

General Index

1. Units Installation 19

1.1. RASC-(3~10)H(V)RNE 22

1.1.1. Transportation 22
1.1.2. Center of gravity 23
1.1.3. Installation space (Initial check) 23
1.1.4. Place provision 24
1.1.5. Available configurations 25
1.1.6. Duct connection 26

2. Piping installation 27

2.1. General notes 28

2.2. Piping work connection considerations 28

2.2.1. Piping materials 28
2.2.2. Three principles on refrigerant piping work 30
2.2.3. Suspension of refrigerant piping 31
2.2.4. Brazing work 32
2.2.5. Caution of the pressure by check joint 33
2.2.6. Refrigerant charge quantity 34
2.2.7. Pump down refrigerant 35

2.3. Suspension of refrigerant piping 36

2.4. Piping connection 37

2.4.1. Tightening torque 37
2.4.2. Flange piping connection (only for RASC-10HRNE) 39

2.5. Piping and refrigerant charge 40

2.5.1. General process 40
2.5.2. Refrigerant piping range 41
2.5.3. Refrigerant piping length 42
2.5.4. Refrigerant piping selection 44

2.6. Twin and quad system installation 45

2.6.1. Height difference between indoor units and distributor 45
2.6.2. Installing distributor 45

2.7. Rasc unit factory refrigerant charge (wo kg) 47

2.8. Additional refrigerant charge calculation 47

2.9. Drain piping 48

3. Electrical wiring 51

3.1. General check 52

3.2. Electrical wiring for outdoor units 53

3.2.1 Electrical wiring connection for outdoor units 53
3.2.2. Setting of DIP switches for outdoor unit 54

3.3. Electrical wiring between indoor unit and outdoor unit 57

3.4. Wire size 58

3.5. Electrical wiring diagrams 60

3.5.1. Electrical wiring diagram for RASC-(3/5)HVRNE 60
3.5.2. Electrical wiring diagram for RASC-10HRNE 61

4. Control system 63

4.1. Device control system 64

4.2. RASC-(3~10)H(V)RNE PCB 66

4.3. Protection and safety control 67

4.4. Standard operation sequence 68

4.4.1. Cooling operation 68
4.4.2. Dry operation 70
4.4.3. Heating operation 72
4.4.4. Defrost operation control 74

4.5. Standard control functions 75

4.5.1. Freezing protection during cooling process or dry operation 75
4.5.2. Prevention control for excessively high discharge gas temperature 76
4.5.3. Outdoor unit electrical expansion valve control 77
4.5.4. Activation of protection device control 78
4.5.5. Outdoor Unit fan control during cooling operation 79
4.5.6. Outdoor unit fan control during heating operation 80
4.5.7. Preheating control of compressor 81
4.5.8. Prevention control for high pressure increase 81

5. Available optional functions 83

5.1. RASC-(3~10)H(V)RNE Units 84

5.1.1. Available ports 84
5.1.2. Configuration 86
5.1.3. Description of optional input signals. 88
5.1.4. Description of optional output signals 89
5.1.5. Optional functions 89
5.1.6. Outdoor units available optional functions 94

5.2. Available optional functions through the remote control switch (PC-ART) 95
5.2.1. Optional function setting 95
5.2.2. Optional functions of the remote control switch 99
5.3. Available optional functions through the remote control switch (PC-ARH) 108
5.3.1. Alarm indication 109
5.4. Available optional functions through wireless remote control switch (PC-LH3A + receiver) 110
6. Test run 111
6.1. Checking procedure before the test run 112
6.2. Test run procedure using the remote control switch 114
6.3. Test run procedure using the wireless remote control switch 115
6.4. Test run procedure from the outdoor unit side 117
6.5. Normal operation pressure 118
6.6. Check list 120
7. Troubleshooting 123
7.1. Initial troubleshooting 124
7.1.1. Checking using the 7-segment display 124
7.1.2. Failure of the power supply to the indoor unit and the remote control switch 125
7.1.3. Abnormal transmission between the remote control switch and the indoor unit 126
7.1.4. Abnormal operation of the devices 127
7.2. Troubleshooting procedure 135
7.2.1. Alarm code 135
7.2.2. Troubleshooting by alarm code 137
7.2.3. Troubleshooting in check mode 176
7.2.4. Troubleshooting using the 7 segment display 182
7.2.5. Cause of inverter stoppage 184
7.3. Procedure for checking each main part 187
7.3.1. Self-checking procedure of PCB using the remote control switch 187
7.3.2. Self-checking procedure of the Remote Control Switch 189
7.3.3. Checking procedure of other main parts 191
8. Spare parts 201
8.1. RASC-(3/5)HVRNE 202
8.1.1. Cabinet and Fan 202
8.1.2. Refrigerant Cycle 204
8.1.3. Electrical equipament 206

8.2. RASC-10HRNE 208

8.2.1. Cabinet and Fan 208
8.2.2. Refrigerant Cycle 210
8.2.3. Electrical equipment 212

9. Servicing 215

9.1. RASC-(3/5)HVRNE 217

9.1.1. Removing piping service cover 217
9.1.2. Removing fan service cover 217
9.1.3. Removing electrical box service cover 217
9.1.4. Removing the outdoor unit fan motor 218
9.1.5. Removing the compressor 220
9.1.6. Removing the high pressure switch (PSH) and pressure switch for control (PSC) 222
9.1.7. Removing reversing valve coil 222
9.1.8. Removing expansion valve coil 223
9.1.9. Removing expansion valve 223
9.1.10. Removing reversing valve 224
9.1.11. Removing solenoid valve 225
9.1.12. Removing the PCB 226
9.1.13. Removing electrical components 227

9.2. RASC-10HRNE 228

9.2.1. Removing piping service cover 228
9.2.2. Removing fan service cover 228
9.2.3. Removing electrical box service cover 228
9.2.4. Removing the outdoor unit fan motor 229
9.2.5. Removing the compressor 231
9.2.6. Removing the high pressure switch (PSH) and pressure switch for control (PSC) 233
9.2.7. Removing reversing valve coil 233
9.2.8. Removing expansion valve coil 234
9.2.9. Removing expansion valve 234
9.2.10. Removing reversing valve 235
9.2.11. Removing solenoid valve 235
9.2.12. Removing the PCB 236
9.2.13. Removing electrical components 237

9.3. Collecting refrigerant for replacing indoor unit 238

10. Main parts 239

10.1. Inverter 240

10.1.1. Specifications of inverter 240
10.1.2. Inverter time chart 242
10.1.3. Protective function 243
10.1.4. Overload control 244

10.2. Thermistor 245

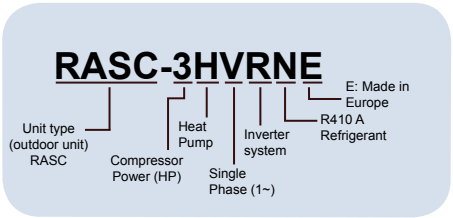
10.3. Electronic expansion valve....247
10.3.1. Electronic expansion valve for outdoor unit....247
10.4. High pressure protection device....248
10.5. Noise filters (NF)....249
10.6. Capacitor (CB1, CB2)....252
10.7. Reactor (DCL)....252
10.8. Scroll compressor....254
10.8.1. Reliable mechanism for low vibrating and low sound....254
10.8.2. Principle of compression....254
11. Field work instruction....255
11.1. Checking the power source and the wiring connection....256
11.2. Burnt-out compressor due to an insufficient refrigerant charge....256
11.3. Insufficient cooling performance when a long piping is applied....257
11.4. Abnormally high operation sound (in-the-ceiling type indoor unit)....257
11.5. Alarm code "31"....258
11.6. Not well cooling due to insufficient installation space for outdoor unit or inlet/outlet air bypass....258
11.7. Caution in case of refrigerant leakage....258
11.7.1. Maximum permitted concentration of HFCs....258
11.7.2. Calculation of refrigerant concentration....259
11.7.3. Countermeasure for refrigerant leakage....259
11.8. Maintenance work....260
11.9. Service and maintenance record....261
11.10. Service and maintenance record using the 7-segment display....262
11.11. Service and maintenance record by remote control switch....263
11.12. Pump-down method for replacing the compressor....264

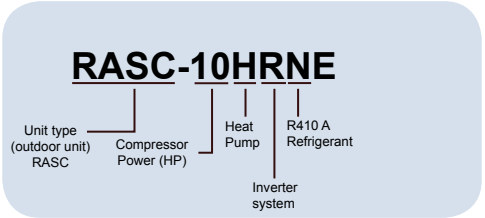
0. Model codes and Description

- Unit code list

	NOTE
-	*All references of the "Built-in horitzontal" units contained into this Service Manual document, have been abbreviated as "RASC" unit.*

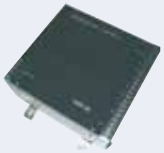
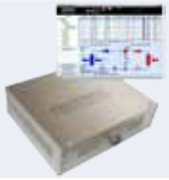
Unit	Code	Unit	Code
RASC-3HVRNE	7E340005		
RASC-5HVRNE	7E340008		
		RASC-10HRNE	7E340111
❄ 1~		❄ 3N~	

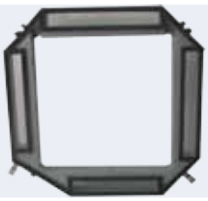
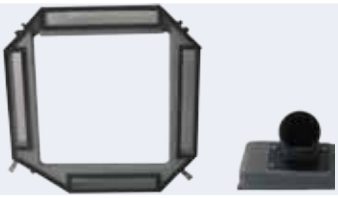


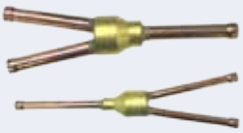
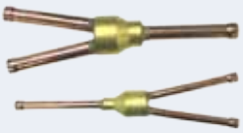


ACCESSORY CODE LIST

Accessory	Name	Code	Figure
PC-ART	Wall-mounted remote control switch with timer	70510000	
PC-P2HTE	Remote control switch with timer	7E899954	
PSC-A64S	Central control	60291479	
PSC-A1T	Programmable timer	60291482	
PC-LH3A	Wireless remote control switch	60291056	
PC-ARH	Optional remote controller	60291486	
PC-ALH	Receiver kit (for RCI-FSN2E -on the panel-)	60291464	
PC-ALHD	Receiver kit (for RCD-FSN2· -on the panel-)	60291467	
PC-ALHZ	Receiver kit (for RCI, RCD, RPC, RPI, RPK, RPF(I) -(FSN2E) -on the wall-)	60291473	
PC-ALHC	Receiver kit (for RCIM-FSN2E -on the panel-)	60291476	Image not available

Accessory	Name	Code	Figure
PSC-5HR	H-LINK relay	60291105	
PCC-1A	Optional function connector	60199286	
PRC-10E1	2-pin extension cord	7E790211	
PRC-15E1	2-pin extension cord	7E790212	
PRC-20E1	2-pin extension cord	7E790213	
PRC-30E1	2-pin extension cord	7E790214	
THM-R2AE	Remote sensor (THM4)	7E799907	
HARC-BXE (A)	Lonwork BMS Interface (7 inputs up to 6 units)	60290874	
HARC-BXE (B)	Lonwork BMS Interface (4 inputs up to 32 units)	60290875	
HARC MOD BUS	Integration with installations with intelligent control (Building Management System) Gateway Interface to LON-WORKS BMS systems.	70513200	
HC-A64BNP	Integration with installations with intelligent control (Building Management System) Gateway Interface to BAC NET BMS systems.	60xxxx11	
CSNET-WEB (V3)	Control System	7E891938	
TS001 WEB SCREEN	15-inch touch-screen display	7E891935	
PCA-1IO	Integration of teams into H-Link	70519000	

Accessory	Name	Code	Figure
HC-A160 SMS	SMS alarm warning device	70519100	
P-N23WA	Air panel for RCI-FSN2E	70530000	
P-N23WAM	Air panel for RCIM-FSN2E	60197160	
P-N23DWA	Air panel for RCD-FSN2E	60291574	
P-N46DWA	Air panel for RCD-FSN2E	60291575	
B-23H4	Adapter for deodorant filter	60199790	
F-23L4-K	Antibacteria filter	60199791	
F-23L4-D	Deodorant filter	60199793	
F-46L4-D	Deodorant filter	60199794	
PDF-23C3	Duct connection flange	60199795	
PDF-46C3	Duct connection flange	60199796	
OACI-232	Fresh-air intake kit	60199797	
PD-75	Fresh-air intake kit	60199798	

Accessory	Name	Code	Figure
PI-23LS5	3-way outlet parts	60199799	
TKCI-232	T-duct connecting kit	60199801	
TE-03N	Branch pipe	70800007	
TE-56N	Branch pipe	70800009	
TE-10N	Branch pipe	70800004	
QE-810N	Branch pipe	70800006	

1. Units Installation

This chapter provides information concerning the installation of outdoor units.

Contents

1. Units Installation 19

1.1. RASC-(3~10)H(V)RNE 22

1.1.1. Transportation 22
1.1.2. Center of gravity 23
1.1.3. Installation space (Initial check) 23
1.1.4. Place provision 24
1.1.5. Available configurations 25
1.1.6. Duct connection 26

DANGER

Electrical hazard. Risk of death.

Before gaining access to terminals or performing any maintenance operation, turn OFF all power switches and disconnect all supply circuits.

Check that the LED201 (red) located on the DIP-IPM is OFF.

Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.

Do not touch the electrical components of the PCB directly.

WARNING

Damage by water. Electrical hazard.

Install the unit indoors to prevent water contact. The water proof class is IPX0.

Install the unit where no high level of oil mist, salty air or sulphurous atmosphere exists.

Attach a water proof cover in order to prevent water getting into the unit when installing.

Risk of explosion. A fire may occur. Use of inflammable agent may cause explosion or fire. For cleaning operation, use non-inflammable and nontoxic cleaning liquid.

Oxygen deficiency. Toxic gases may be produced. Work with sufficient ventilation. Working in an enclosed space is dangerous. Toxic gas may be produced when cleaning agent is heated to high temperature by, e.g., being exposed to fire.

Electric shock. Electrical hazard. In order to avoid electric shock or fire, pay attention not to clamp cables when attaching the service cover.

Electrical hazard. Electrical discharge. This unit contains condensers that might remain charged once the unit is switched off. Wait at least five minutes after the stop of the unit before to start any cleaning or maintenance operation, allowing the discharge of the condensers.

CAUTION

Malfunction. Unit failure. When installing more than one unit together, keep clearance of more than 50 mm between units and avoid obstacles that could hamper air intake.

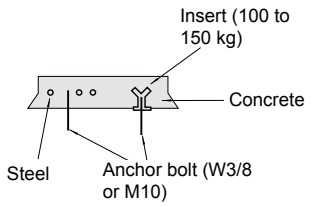
Malfunction. Short circuit. Keep cleareance of more than 3000 mm between the wall (without vent holes) and air inlet/outlet.

Electromagnetic contamination. Equipment failures. Install the unit as far as possible (being at least 3 meters) from electromagnetic wave radiator, such as medical equipment.

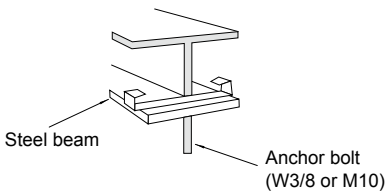
Overheat of the unit. Malfunction. Install the unit in the shade or not exposed to direct sunshine or direct radiation from high temperature heat source.

Sharp fins. Risk of injury. Aluminium fins have very sharp edges. Pay attention to the fins in order to avoid injury. Use gloves.

Mount suspension bolts using M10 (W3/8) as size, as shown below:



Concrete beam



Steel beam

	NOTE
	This appliance is not intended to be used by people (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision and instruction concerning the use of the appliance by a person responsible for their safety. *For easy operation and maintenance, install the unit with sufficient clearance around it as shown in the next pages.* *Transport the package as close as possible to the intallation location before unpacking.* *Make sure that the foundation is flat, levelled and strong enough.* *Install the unit in a place where no seasonal wind might directly blow into the outdoor fan.* *Install the unit in a restricted area not accessible by the general public.* *Cleaning liquid shall be collected after cleaning operation.* *Hitachi indoor units are designed for free air discharge (Static Pressure, Pst=0), except ducted indoor units as RPIM, which require to be connected to discharge air ducts. For these units see flow-static pressure chart.*

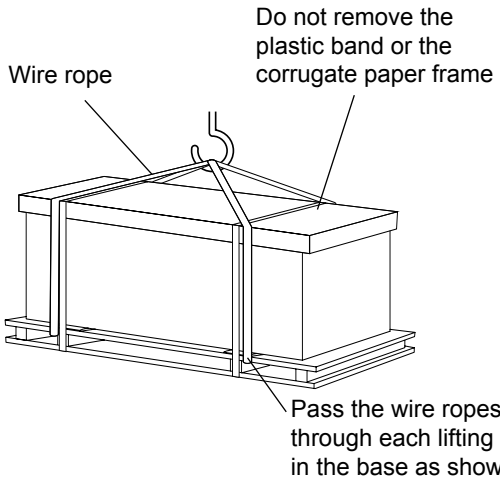
1.1. RASC-(3~10)H(V)RNE

1.1.1. Transportation

	CAUTION
	Malfunction. Unit failure. Do not put any foreign material into the unit and make sure that none exists inside the unit before the installation or test run.

- **Hanging method**

When hanging the unit, ensure its balance and lift it up smoothly and safely. Do not remove any packing materials until the unit is positioned. Hang the unit under packing condition with two ropes, as shown in the figure below.

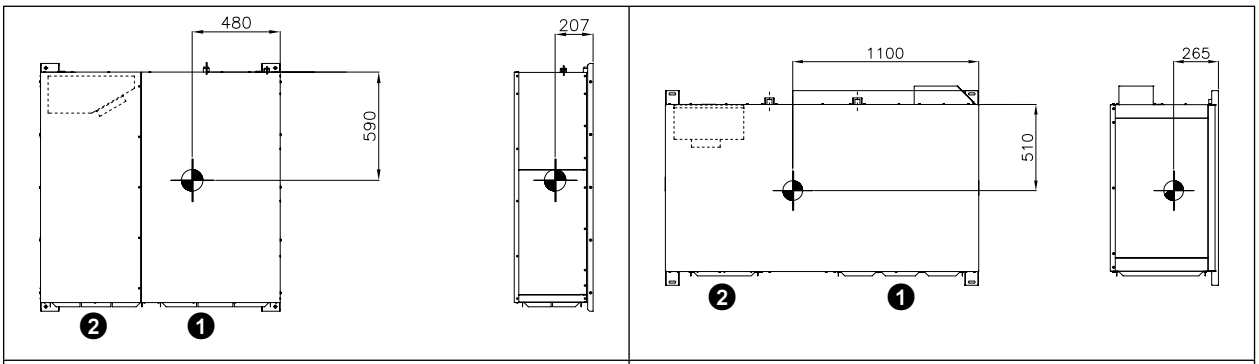

Wire rope
Do not remove the plastic band or the corrugate paper frame
Pass the wire ropes through each lifting hole in the base as shown

	WARNING
	Crush hazard. Can cause seriour injury. *Lift the unit with 2 wire ropes and without removing its factory packaging. Make sure that the unit is lifted smoothly and does not lean.* *Do not attach lifting equipment to the plastic band or the corrugated paper frame, since the ropes might slip or break the materials.*

	NOTE
	Make sure that the exterior of the unit is adequately protected with cloth or paper. *Do not hold the unit with the handles or the air outlet parts. Steel plates may be deformed. Use gloves.*

1.1.2. Center of gravity

When the unit is lifted manually (using the handles), do not remove the wooden base from the unit to prevent its overturning. Pay attention to the center of gravity shown in the figures below.

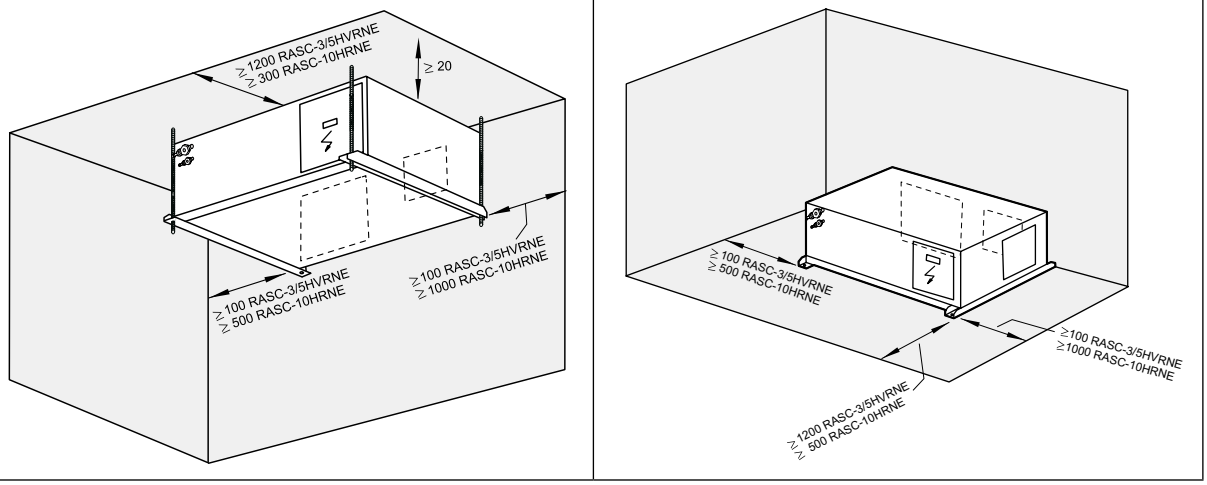


RASC-(3/5)HVRNE	RASC-10HRNE

❶ → Air inlet
❷ → Air outlet

1.1.3. Installation space (Initial check)

Installation in the ceiling	Installation on the floor



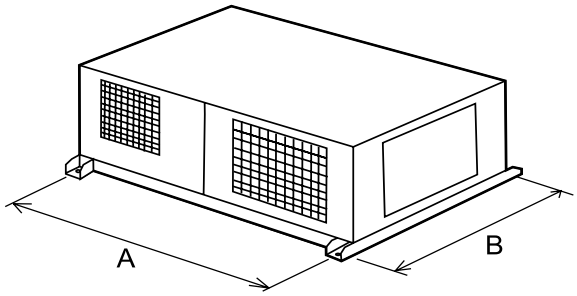
	NOTE
All measuring units are in milimetres (mm).	

1.1.4. Place provision

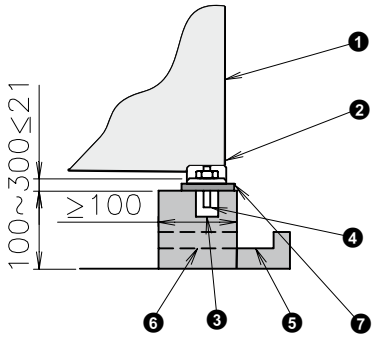
- **Concrete foundation. Installation on the floor.**

1. Foundation shall be on levelled surface and it is recommended to be 100-300mm higher than ground level.
2. Install a drainage around foundation for smooth drain.
3. When installing the unit, fix it by M10 anchor bolts.
4. Use vibration-proof rubber (approx. 60 degree) between the unit and foundation.
5. Drain water might turn into ice on cold weather areas. Therefore, when installing the unit on a roof or a veranda, avoid to drain on a public area, since it may become slippery.
6. Check to ensure that the foundation is water-proof. In other case, apply water-proofing measures.
7. Install the unit so that the drain outlet parts are slightly (approx. 20 mm) lower than the other side, in order to avoid incorrect drain discharge.

Mark	Anchor bolt pitch	
Model	3-5HP	10HP
A(mm)	1250	1770
B(mm)	1300	1113



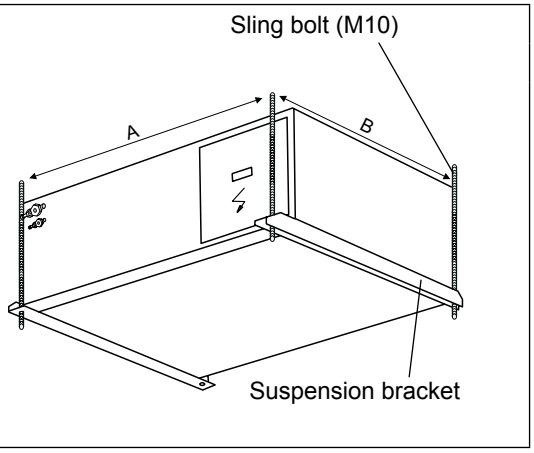
Nº	Description
❶	Unit
❷	Cut this portion of the bolt. Otherwise, it will be an obstacle to remove the service cover
❸	Mortar hole (Ø100 x Depth 150)
❹	Anchor bolt M10
❺	Drainage (Wide 100 x Depth 150)
❻	Drainage
❼	Vibration-proof rubber



- **Suspended unit. Installation in the ceiling.**

1. Suspend the unit as the drawing indicates.
2. Ensure that ceiling can resist the unit weight, which is indicated in the specification label.
3. Install the unit so that the drain outlet parts are slightly (approx. 20 mm) lower than the other side, in order to avoid incorrect drain discharge.

Mark	Sling bolt pitch	
Model	3-5HP	10HP
A(mm)	1250	1770
B(mm)	1300	1113



	WARNING
	Unit fall down. Can cause serious injury or death. If the unit is suspended in the ceiling, ensure that the place for installation is strong enough. If not, reinforce the place with beams, etc., (more than 150 kg for one sling bolt).

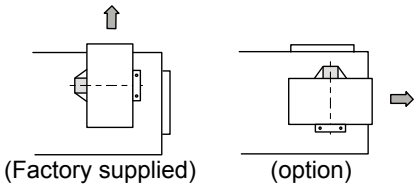
1.1.5. Available configurations

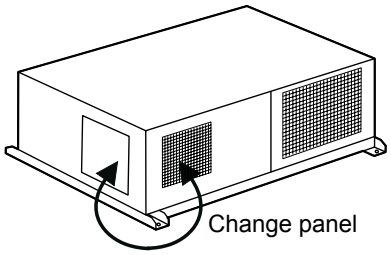
Different configurations are available for RASC unit only changing the inlet/outlet air panels (and fan position for the case of RASC-10HRNE).

- **Air inlet modification (optional)**

Changing air inlet is only necessary to interchange the indicated panels position. Both panels use screws to be fixed to unit chasis.

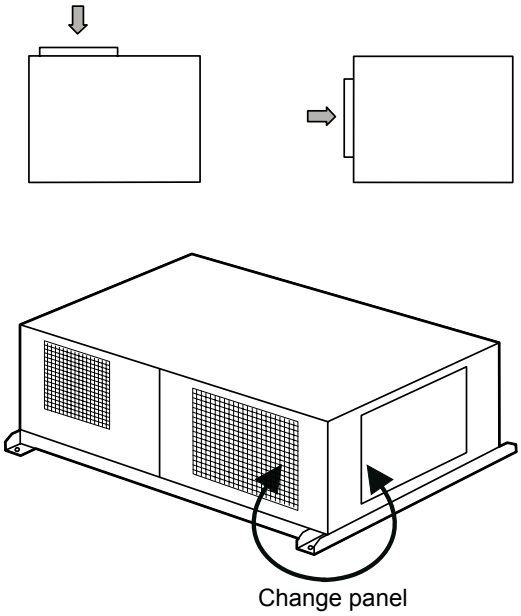
View from top





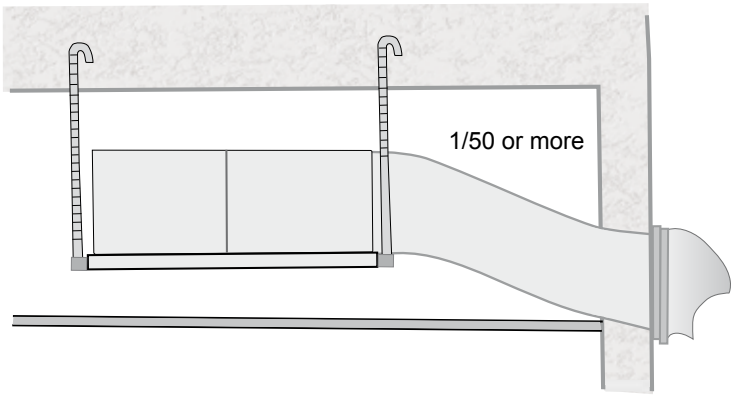
- **Air outlet modification (option only for RASC-10HRNE)**

Changing air outlet is necessary to interchange panels too. Fan outlet panel is attached to fan structure, which must be mounted as follow:



1.1.6. Duct connection

Install the duct with down slope to prevent entry of rain water. Also, provide insulation for duct and connection in order to prevent dew formation.



2. Piping Installation

This chapter provides information about the procedures to perform water piping work connections for outdoor units.

Contents

2. Piping installation 27

2.1. General notes 28

2.2. Piping work connection considerations 28

2.2.1. Piping materials 28
2.2.2. Three principles on refrigerant piping work 30
2.2.3. Suspension of refrigerant piping 31
2.2.4. Brazing work 32
2.2.5. Caution of the pressure by check joint 33
2.2.6. Refrigerant charge quantity 34
2.2.7. Pump down refrigerant 35

2.3. Suspension of refrigerant piping 36

2.4. Piping connection 37

2.4.1. Tightening torque 37
2.4.2. Flange piping connection (only for RASC-10HRNE) 39

2.5. Piping and refrigerant charge 40

2.5.1. General process 40
2.5.2. Refrigerant piping range 41
2.5.3. Refrigerant piping length 42
2.5.4. Refrigerant piping selection 44

2.6. Twin and quad system installation 45

2.6.1. Height difference between indoor units and distributor 45
2.6.2. Installing distributor 45

2.7. Rasc unit factory refrigerant charge (wo kg) 47

2.8. Additional refrigerant charge calculation 47

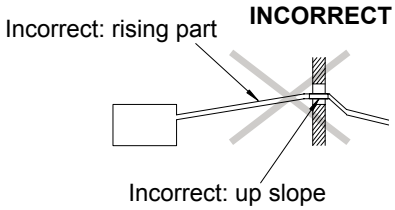
2.9. Drain piping 48

2.1. General notes

1. Connect all pipes as close as possible to the unit, so that disconnection can be easily performed when required.

2. Install the drainage in accordance with national and local codes.

3. Do not install the drain-pipe in an up-slope position. Installing it like this, the drain water cannot be evacuated and will flow back to the unit, causing a possible leakage when the operation is stopped. Always install the unit higher than the exit of the pipe. Making this so, the water will flow easily to the outside.



4. It is recommended to use flexible joints for the piping of water inlet and outlet, so vibration will not be transmited.

5. Do not connect the drain pipe with the sanitary piping, the sewage piping or any other drainage piping.

6. The drain pipe will require insulation if it is installed in a location where the ambient humidity may condensate on the drain pipe outer surface. This condensation could drop and cause damage. The insulation for the drain pipe must be selected in order to ensure that the vapor is sealed and in order to prevent the condensation forming.

2.2. Piping work connection considerations

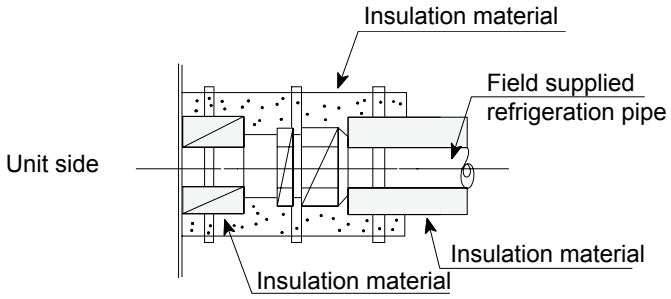
2.2.1. Piping materials

1. In order to avoid supply problems in terms of local regulations and quality, prepare locally-supplied copper pipes.

	NOTE
-	*In case of using copper pipes for piping sections bigger than Ø 19.05 mm (3/4 inches), flaring work cannot be performed. If necessary, use a joint adapter.*

2. Select clean copper pipes. Make sure there is not dust and moisture inside. Blow the inside of the pipes with oxygen free nitrogen to remove any dust and foreign materials before connecting the pipes.

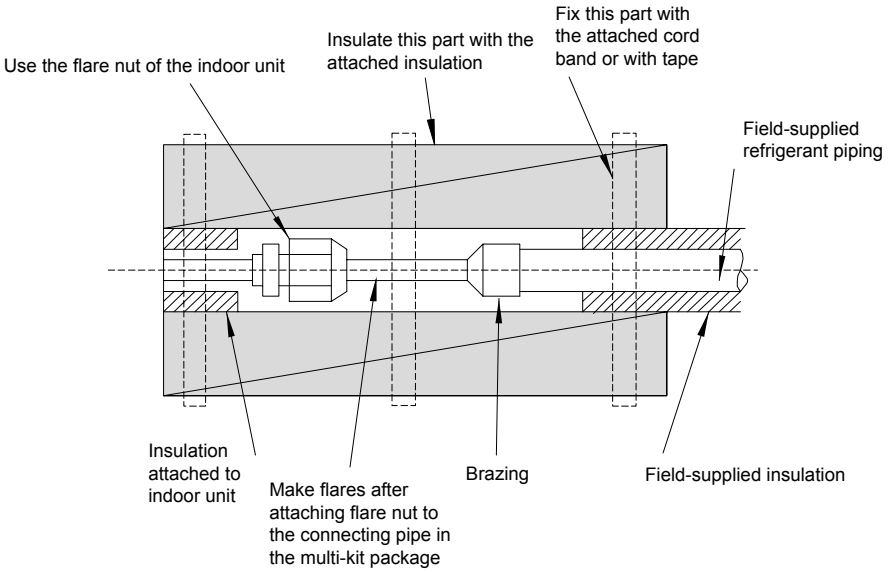
3. After connecting the refrigerant piping, seal the open space between Knockout hole and refrigerant pipes by using insulation material as shown below:



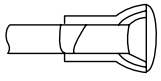
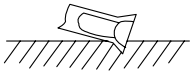
	CAUTION
	- *Several hazards due to contamination or impacts. Can cause serious injury.* - *Do not use a saw and a grindstone or other tools which cause copper powder.* - *When cutting pipes, secure the part for brazing in accordance with both national and local regulations.* - *Use security glasses and gloves for cutting or welding works.*

- **Piping Connection**

When connecting liquid piping for units with piping longer than 15 meters, apply a piping size of Ø9.53 mm (3/8 inches). Fix the connecting pipe as shown in the following figure using the insulation attached to the Indoor Unit.


Use the flare nut of the indoor unit
Insulate this part with the attached insulation
Fix this part with the attached cord band or with tape
Field-supplied refrigerant piping
Insulation attached to indoor unit
Make flares after attaching flare nut to the connecting pipe in the multi-kit package
Brazing
Field-supplied insulation

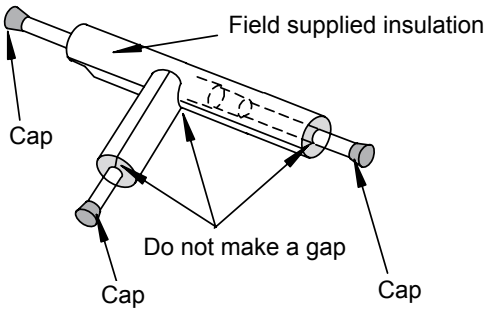
	NOTE
	- *A system with no moisture or oil contamination will give maximum performance and lifecycle compared to a poorly prepared system. Take particular care to ensure that all copper piping is clean and dry internally.* - *To ensure this, blow oxygen-free nitrogen through the pipes.* - *When inserting a pipe through any hole protect the end with a cap.* - *Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe*

Correct	Incorrect
	

- If the piping installation is not completed until the next day or even over a longer period of time, braze off the ends of the piping and charge the pipe with oxygen-free nitrogen through a Schrader-valve-type access-fitting, to prevent moisture and particle contamination entering.
- Do not use insulation material that contents NH3. NH3 can damage the cooper pipe material and can be a source of future leakages

- **Insulation**

  Attach the pipe insulation to each branch using vinyl tape. Attach also insulation to field supplied pipes in order to prevent the capacity decrease according to the ambient air conditions and dewing on the low pressure pipe surface.



	NOTE
	- *When polyethylene foam is applied, it is recommended the usage of a wall thickness of 10 mm for the liquid piping and 15 mm to 20 mm for the gas piping.* - *Perform the insulation work after the pipe surface temperature decreases to the room temperature, if not the insulation material may melt.* - *If the ends of the piping system are open after ending the piping work, attach caps or vinyl bags securely to the ends of the piping, avoiding moisture and dust entering.*

2.2.2. Three principles on refrigerant piping work

In case of using refrigerant R410A in the refrigeration cycle, the refrigeration oil should be of a synthetic type one.

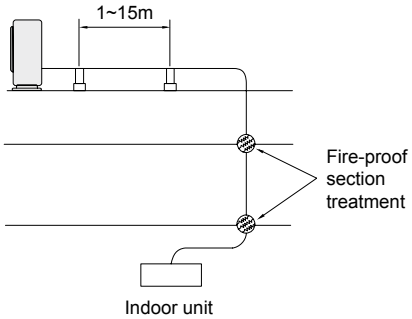
In order to avoid oxidation, pay much careful attention to basic piping work control to avoid infiltration of moisture or dust during the refrigerant piping work.

Three principles	Cause of failure	Presumable failure	Preventive action
1. Dry Keep good dryness	- Water infiltration due to insufficient protection at pipe ends - Dewing inside of pipes - Insufficient vacuum pumping time	Icing inside tube at ex. valve (Water choking) + Generation of hydration and oxidation of oil ↓ Clogged strainer, etc., insulation failure and compressor failure	Pipe protection 1 Pinching 2 Taping ↓ Flushing ↓ Vacuum Drying - One gram of water turns into gas (approx. 1000 lrs) at 1 Torr - Therefore, it takes long time to vacuum-pump by a small vacuum pump
2. Clean No dust inside of pipes	- Infiltration of dust or other through the pipe ends - Oxidation film during brazing without blowing nitrogen - Insufficient flushing by nitrogen after brazing	Clogging of expansion valve, capillary tube and filter Oxidation of oil Compressor failure ↓ Insufficient cooling or heating compressor failure	Pipe Protection 1 Mounting Caps 2 Taping 3 Pinching ↓ Flushing
3. No leakage No leakage shall exist	- Brazing failure - Failed flaring work and insufficient torque of squeezing flare - Insufficient torque of squeezing flanges	Refrigerant shortage Performance decrease Oxidation of oil ☛ Overheating of compressor ↓ Insufficient cooling or heating compressor failure	Careful Basic Brazing Work ↓ Basic Flaring Work ↓ Basic Flange Connecting Work ↓ Air Tight Test ↓ Holding of Vacuum

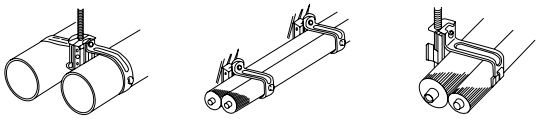
(Comes from page 2-5)

2.2.3. Suspension of refrigerant piping

Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching weak parts of the building such as walls, ceiling, etc. (If touched, abnormal noises may occur due to the vibration of the piping. Pay special attention in case of short piping length).



In order to fix the piping to wall or ceilings use suspension and clamping systems as shown in the following figure.

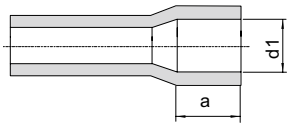


2.2.4. Brazing work

The most important work in the refrigerant piping installation work is the brazing of the pipes. If it accidentally occurs a leakage due to a careless brazing process, it will cause clogged capillary pipes or serious compressor failure.

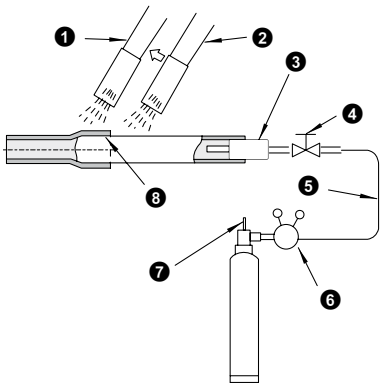
It is important to control the clearance of the pipe fitting portion as shown below. In the case that a cooper tube expansion jig is used, following dimensions should be secured.

In order to guarantee a proper brazing neck between different pipes surfaces, accurate pipe dimensions after the expansion process (see the following table):



Copper pipe size	Ød1	Gap	a	Copper pipe size	Ød1	Gap	a
+0.08 Ø6.35 -0.08	+0.1 Ø6.5 0	0.33 0.07	6	+0.09 Ø22.22 -0.09	+0.1 Ø22.42 0	0.39 0.11	10
+0.08 Ø9.53 -0.08	+0.1 Ø9.7 0	0.35 0.09	8	+0.12 Ø25.4 -0.12	+0.1 Ø25.6 0	0.42 0.08	12
+0.08 Ø12.7 -0.08	+0.1 Ø12.9 0	0.38 0.19	8	+0.12 Ø28.58 -0.12	+0.1 Ø28.78 0	0.42 0.08	12
+0.09 Ø15.88 -0.09	+0.1 Ø16.1 0	0.41 0.13	8	+0.12 Ø31.75 -0.12	+0.1 Ø32.0 0	0.47 0.13	12
+0.09 Ø19.05 -0.09	+0.1 Ø19.3 0	0.44 0.16	10	+0.12 Ø38.1 -0.12	+0.1 Ø38.3 0	0.52 0.18	14

A basic brazing method is shown below.



1. Pre-heat the outer tube for better flowing of the filler metal
2. Heat inner side tube evenly
3. Rubber plug
4. Packless valve
5. High pressure hose
6. 0.03 to 0.05 MPa (0.3 to 0.5 Kg/cm^2 G)
7. Reducer valve: open this valve only when the gas is needed
8. Nitrogen gas flow 0.05m^3/h or smaller

	CAUTION

- *Risk of explosion. Can cause serious injuries and generate poisonous gases.*
- *Use nitrogen gas for blowing during pipe brazing. Do not use oxygen, acetylene or fluorocarbon gas.*
- *Use a reducer valve when nitrogen gas blowing is performed during brazing. The gas pressure should be maintained within 0.03 to 0.05 MPa.*
- *Do not charge OXYGEN, ACETYLENE, or other flammable and poisonous gases into the refrigerant because an explosion will occur. It is recommended that oxygen free nitrogen be charged for these types of tests cycle when performing a leakage test or an airtight test. These types of gases are extremely dangerous.*
- *Insulate the unions and flare-nuts at the piping connection part completely.*
- *Insulate the liquid piping completely to avoid a decrease of performance; if not, it will cause sweating on the surface of the pipe.*
- *Charge refrigerant correctly. Overcharging or insufficient charging could cause a compressor failure.*
- *Check for refrigerant leakage in detail. If a large refrigerant leakage occurred, it would cause difficulty with breathing or harmful gases would occur if a fire were being used in the room.*
- *If the flare nut is tigthened too hard, the flare nut may crack after a long time and cause refrigerant leakage.*

	NOTE

- *During the brazing work, a lot of oxidation film will be generated inside of the pipes if no oxygen-free nitrogen gas is blown through the pipes. This film will be flecked off after operation and will circulate in the refrigeration cycle, resulting in clogged expansion valves, etc. This coud origin problems in the compressor.*

2.2.5. Caution of the pressure by check joint

When the pressure is measured, use the check joint of gas stop valve (❶), and use the check joint of liquid piping (❷) in the figure below.

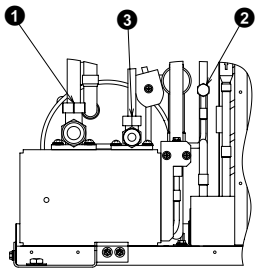
At that time, connect the pressure gauge according to the following table because of high pressure side and low pressure side changes by operation mode.

	Cooling Operation	Heating Operation
Check joint for gas stop valve "❶"	Low pressure	High pressure
Check joint for piping "❷"	High pressure	Low pressure
Check joint for liquid stop valve "❸"	Exclussive for vacuum pump and refrigerant charge	

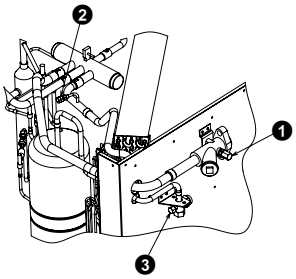
	NOTE

- *Be careful that refrigerant and oil do not splash to the electrical parts when removing the charge hoses.*

The below figures show examples of 3/5 HP and 10HP



RASC-(3/5)HVRNE case

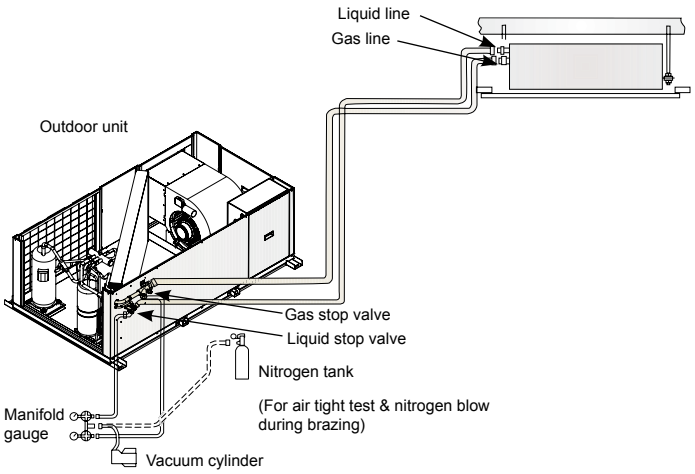


RASC-10HRNE case

2.2.6. Refrigerant charge quantity

	WARNING
	- *Explosion risk. Can cause serious injury or death.* - *Some types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.* - *Check to ensure that no pressure exists inside the stop valve before removing the flange.* - *Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test.*

- **Evacuation and refrigerant charge**
  - Evacuation and refrigerant charging procedure should be performed according to the following instructions.
  - The stop valve has been closed before shipment. However, make sure that the stop valves are closed completely. Connect the indoor unit and the outdoor unit with field-supplied refrigerant piping.
  - Connect the gauge manifold using charging hoses with a vacuum pump or a nitrogen cylinder to the check joints of the liquid line and the gas line stop valve.
  - Check for any gas leakage at the flare nut connection, by using nitrogen gas to increase the pressure at 4.15 MPa inside of the field-supplied piping.
  - Operate the vacuum pump for 1 to 2 hours until the pressure decreases lower than a pressure of 756 mm Hg in vacuum.
  - For charging refrigerant, connect the gauge manifold using charging hoses with a refrigerant charging cylinder to the check joint of the liquid line stop valve.
  - Charge the proper quantity of refrigerant according to the piping length (Calculate the quantity of the refrigerant charge).
  - Fully open the gas line stop valve, and slightly open the liquid line stop valve.
  - Charge refrigerant by opening the gauge manifold valve.
  - Charge the required refrigerant within the difference range of ±0.5kg by operating the system in cooling.
  - Fully open the liquid line stop valve after completing refrigerant charge.
  - Continue cooling operation for more than 10 minutes to circulate the refrigerant.
  - Remove the “close” plate from the stop valve and hook the attached “open” plate at the stop valve.



Example of evacuation and refrigerant charge for RASC-H(V)RNE

	NOTE
-	*Check to ensure that there is no gas leakage. When large amount of the refrigerant leaks, the troubles as follows may occur:*
-	*Oxygen deficiency.*
-	*Generation of Harmful gas Due to Chemical Reaction with fire.*
-	*Use thick gloves to protect your hands from liquid refrigerant injuries when handling refrigerant.*
-	*Charge the refrigerant correctly after calculation. Overcharge or insufficient charge of the refrigerant may cause the compressor failure. Insulate the liquid pipe for prevention of the capacity decrease according to the ambient air conditions and the dewing on the pipe surface by the low pressure.*

Outdoor units has been charged with refrigerant for 20 m (RASC-3HVRNE) or 30 m (RASC-5HVRNE) of pipe length. It is required that additional refrigerant be charged according the piping length if it is longer than 20 m (RASC-3HVRNE) or 30 m (RASC-5HVRNE).

	CAUTION
-	*Refrigerant over/undercharge. Compressor failure. When charging refrigerant, accurate refrigerant quantity must be charged.*

2.2.7. Pump down refrigerant

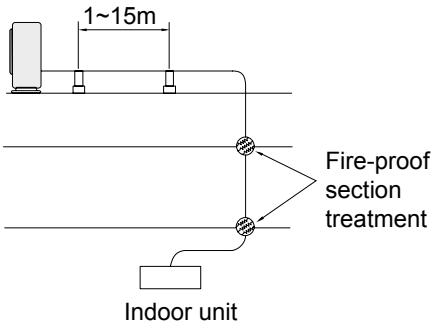
When the refrigerant should be collected into the RASC unit due to indoor/outdoor unit relocation, collect the refrigerant as follows:

1. Attach the manifold gauge to the gas stop valve and the liquid stop valve
2. Turn ON the power source
3. Set the DSW1-1 pin of the RASC unit PCB at the “ON” side for cooling operation. Close the liquid stop valve and collect the refrigerant.
4. When the pressure at lower pressure side (gas stop valve) indicates -0.01 MPa (-100 mmHg), perform the following procedures immediately.
   Close the gas stop valve.
   Set the DSW1-1 pin at the “OFF” side (To stop the unit operation).
5. Turn OFF the power source.

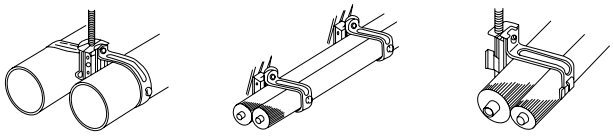
	CAUTION
-	*Incorrect pressure. Compressor failure. Measure the low pressure by the pressure gauge and keep it in a measurement higher than -0.01 MPa.*

2.3. Suspension of refrigerant piping

Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching weak parts of the building such as walls, ceiling, etc. If touched, abnormal noises may occur due to the vibration of the piping. Pay special attention in case of short piping length.



Do not fix the refrigerant piping directly with the metal fittings (The refrigerant piping may expand and contract). In order to fix the piping to wall or ceilings, use suspension and clamping systems as shown in the following figure.



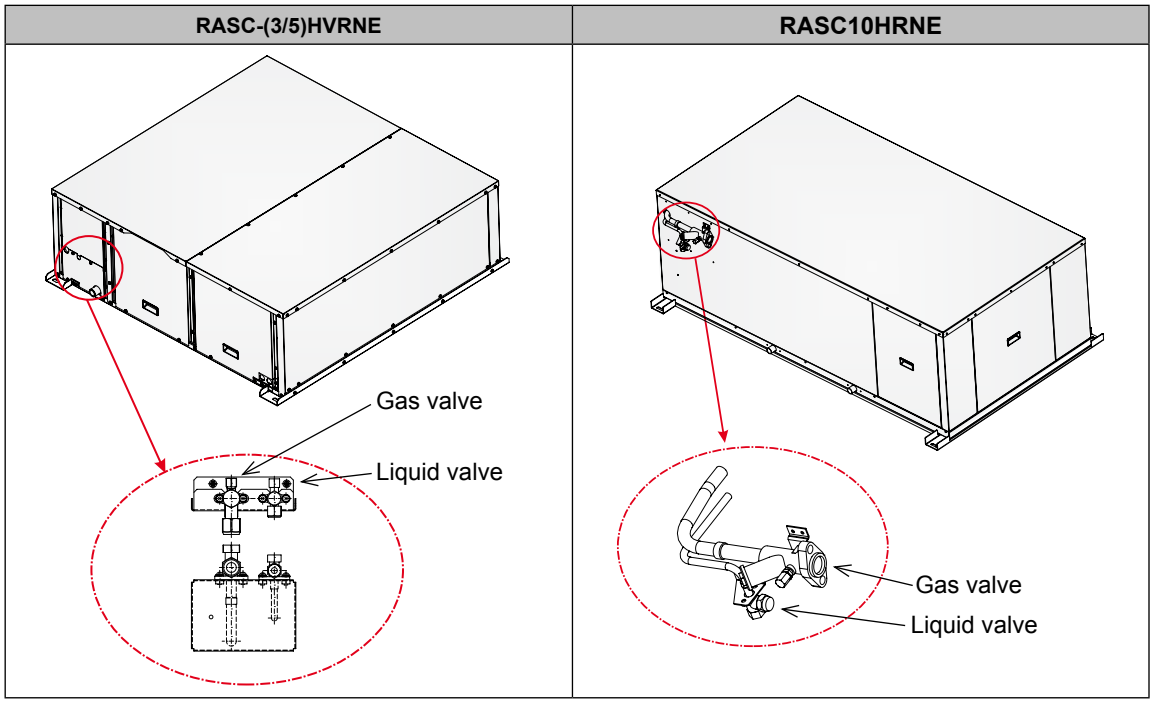
Heavy piping suspension | Piping along the wall | Instant installation work

2.4. Piping connection

1. Stop valve is located on rear cover side of unit. Before connecting refrigerant piping, the stop valve protection cover shall be removed.

2. It is recommended to use a tube bender for pipe bending work.

3. For gas pipe connection, use the factory supplied flange pipe (Only for RASC-10HRNE).



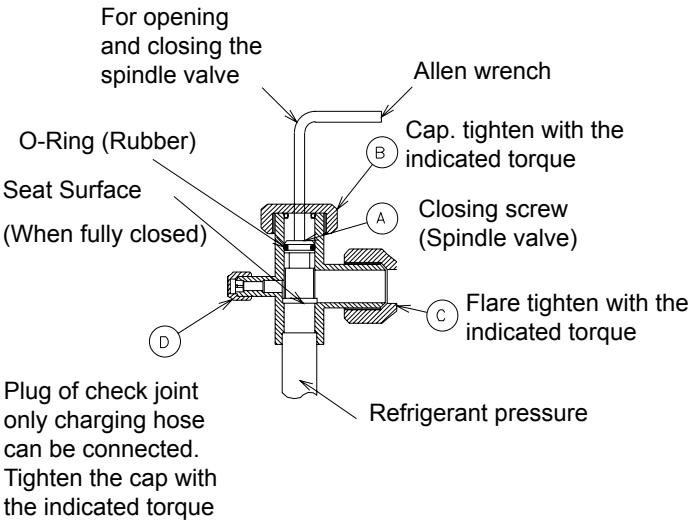
2.4.1. Tightening torque

See tighten torque in the next table:

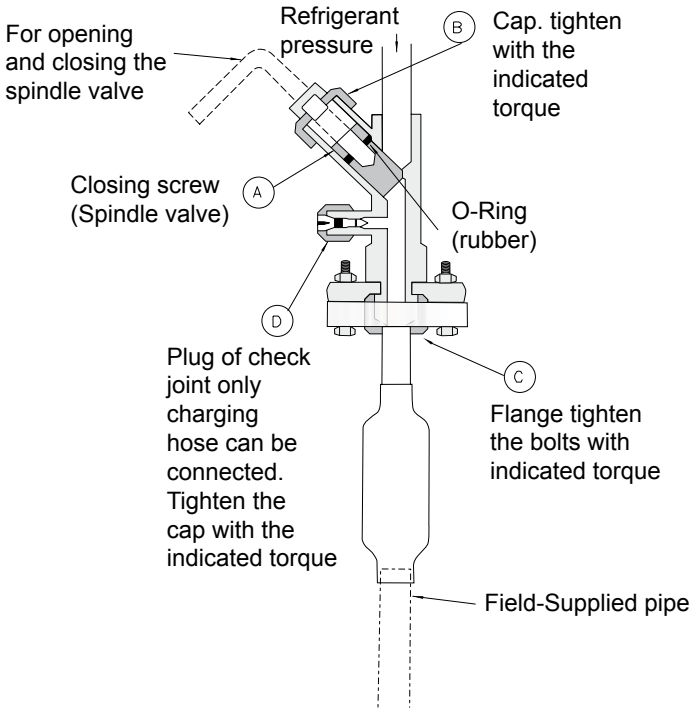
Valve			Size		Tightening torque (N.m)			
			Pipe size	Allen wrench size	A	B	C	D
Liquid	RASC-(3/5) HVRNE	Fig. a	9.53 (3/8")	4 mm	8	16.5	40	14~18
	RASC-10HRNE	Fig. a	12.7 (1/2")	5 mm	8	38	40	9.8
Gas	RASC-(3/5) HVRNE	Fig. a	15.88 (5/8")	5 mm	10	30	80	14~18
	RASC-10HRNE	Fig. b	25.4 (1")	10 mm	25	49	55~75(*)	9.8

(*) Flange connection, check specific instruction on flange piping connection paragraph.

(Fig. a)



(Fig. b)

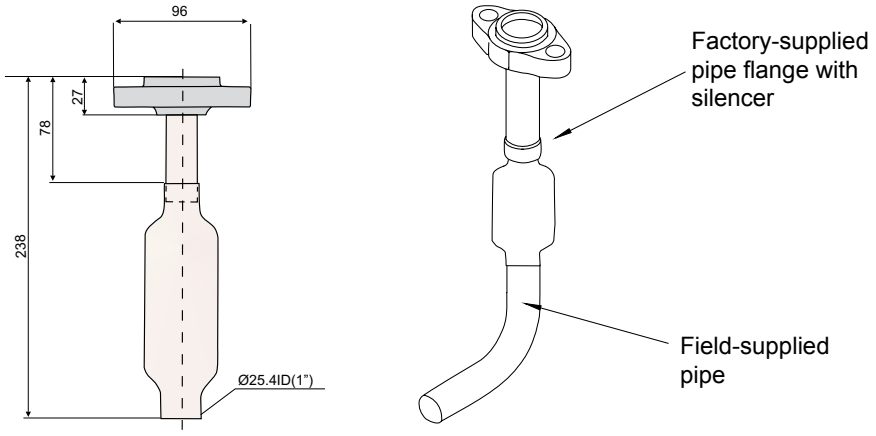

For opening and closing the spindle valve
Refrigerant pressure
Cap. tighten with the indicated torque
Closing screw (Spindle valve)
O-Ring (rubber)
Plug of check joint only charging hose can be connected. Tighten the cap with the indicated torque
Flange tighten the bolts with indicated torque
Field-Supplied pipe
A
B
C
D

	CAUTION
- *Damage to devices. Unit failure. At the test run, fully open the spindle valve.*	

	NOTE
- *Do not apply force to the spindle valve at the end of opening (5 N.m or smaller). The back seat construction is not provided.*	

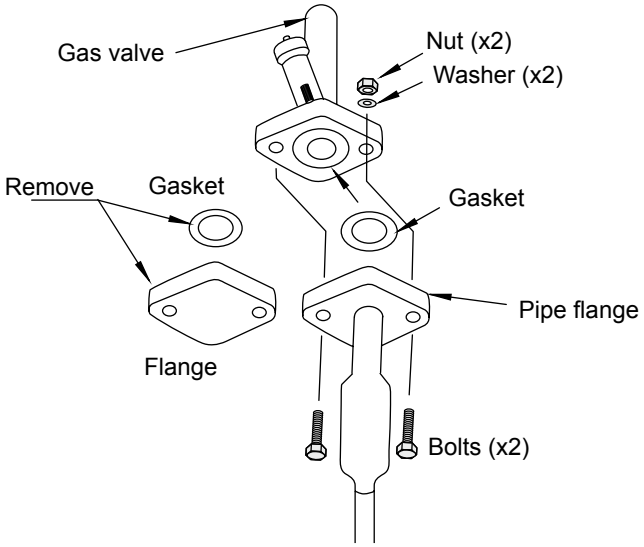
2.4.2. Flange piping connection (only for RASC-10HRNE)

Confirm that the valve is closed. Prepare a field-supplied bend pipe for liquid line. Connect it to the liquid valve by flare nut through the square hole of bottom base.



Factory supplied accesory

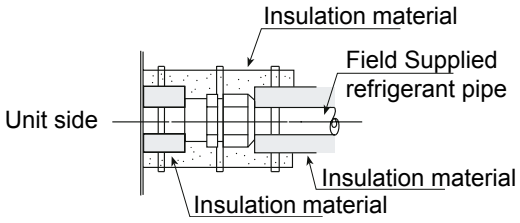
Prepare a field-supplied pipe for gas line. Solder it and the factory-supplied pipe flange at the outside of the unit. Connect the pipe flange to gas valve with the factory-supplied gasket through the square hole of Bottom Base. Do not use the gasket that had been attached to the unit.



2.5. Piping and refrigerant charge

2.5.1. General process

1. Prepare locally-supplied copper pipes.
2. Select the piping size with the correct thickness and correct material, which must have sufficient pressure strength.
3. Select clean copper pipes. Make sure there is no dust and moisture inside. Blow the inside of the pipes with oxygen free nitrogen to remove any dust and foreign materials before connecting pipes.
4. After connecting the refrigerant piping, seal the open space between knockout hole and refrigerant pipes by using insulation material as shown below:

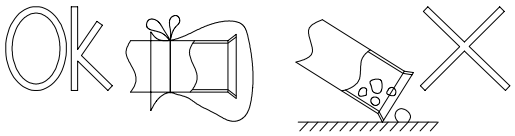


NOTE

- *A system with no moisture or oil contamination will give maximum performance and life cycle compared to a poorly prepared system. Take particular care to ensure all copper piping is clean and dry internally.*
- *There is no refrigerant in the cycle of the indoor unit.*

CAUTION

- *Material contamination. Performance reduction. Cap the end of the pipe when pipe is to be inserted through a hole. Also, do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.*

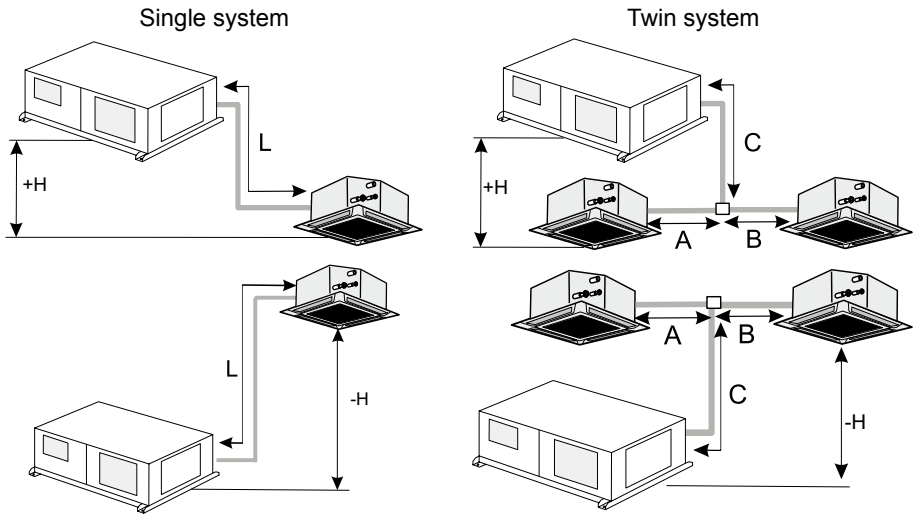


- *Moisture and particle contamination. Performance reduction. If piping installation is not completed until next day or over a longer period of time, braze off the ends of the piping and charge with oxygen free nitrogen through a Schrader valve type access fitting.*
- *Damage to cooper pipes. Perfomance reduction. Do not use insulation material that contents NH3 because NH3 damage the cooper pipes and can be a source of future leakage.*
- *Dew in piping surface. May result in slippery ground. Completely insulate both refrigerant gas piping and liquid piping between the indoor units and the outdoor unit.*

2.5.2. Refrigerant piping range

The piping selection and the distribution must be designed according to the following specifications:

Example of single and twin systems

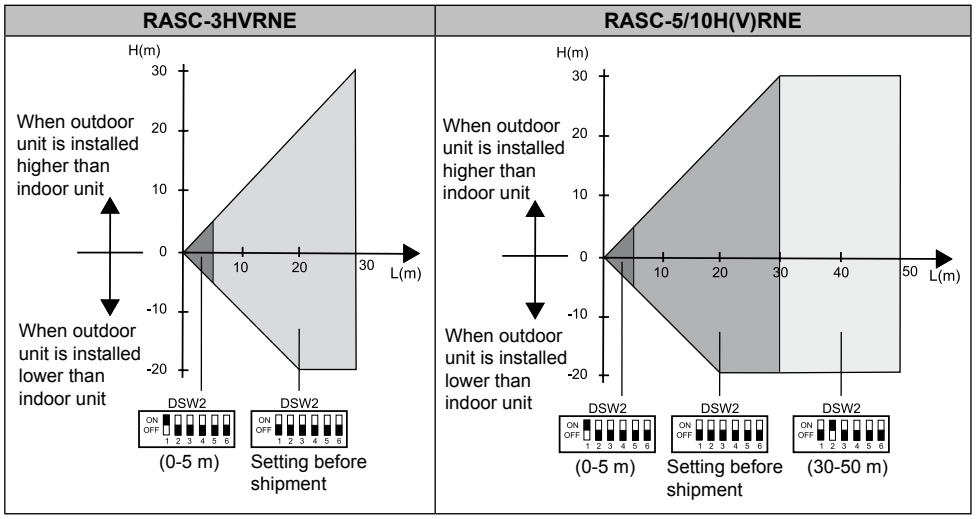


Item		Applicable range	
		RASC-3HVRNE	RASC-5/10H(V)RNE
Actual length between O.U. and the farthest I.U.	Single: L	30	50
	Twin: C + (A or B)		
Equivalent length between O.U. and the farthest I.U.	Single: Leq	45	70
	Twin: (C + (A or B))eq		
Total piping length			
Piping length from each I.U.: A,B (m)			
Lift between I.U. and O.U.: H (m)	O.U. is higher: +H (m)	30	
	O.U. is lower: -H (m)	20	
Lift between I.U. (m)		0.5	

I.U.: indoor unit

2.5.3. Refrigerant piping length

The refrigerant piping length between indoor units and outdoor units must be designed using the following chart. Maintain the design point within the dark area of the chart, which shows the height difference according to the piping length.



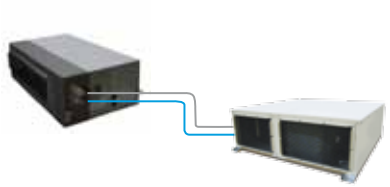
- **Maximum piping length according to the unit:**

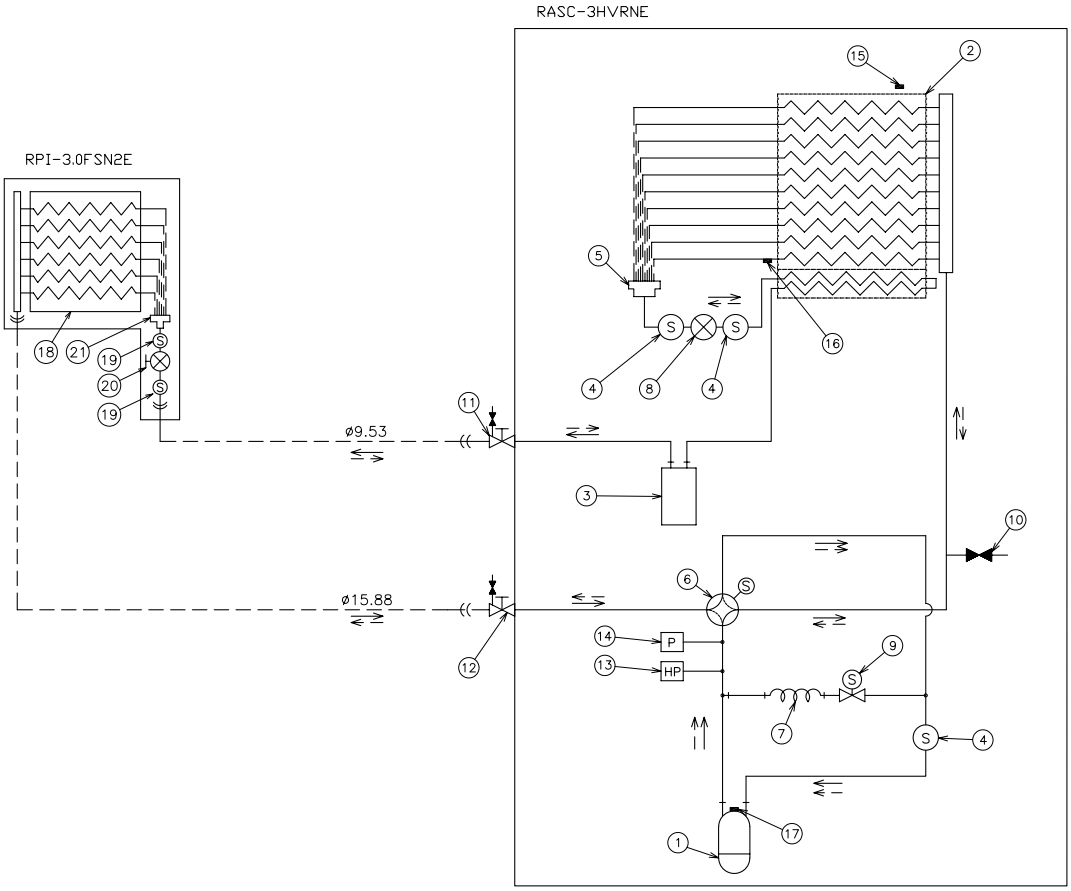
Mark	Unit	Maximum piping length	
		Actual piping length	Equivalent piping length
L	RASC-3HVRNE	≤ 30 m	≤ 45 m
	RASC-(5/10)H(V)RNE	≤ 50 m	≤ 70 m

L = Piping length.

	NOTE
-	*Install the branch pipe at the location from where the piping length to the indoor units is of equal distance. However, when different piping lengths from the branch pipe to the indoor units, due to building construction are required, the difference between the two pipes should be less than 8 m.*

- **Single combination example based on RASC-3HVRNE and RPI models:**





Cooling Refrigerant Flow	Heating Refrigerant Flow	Installation Refrigerant Piping Line	Flare Nut Connectiion	Flange Connection	Brazing Connection

Nº	Name of Item
1	Compressor
2	Heat exchanger
3	Liquid tank
4	Strainer
5	Distributor
6	Revercing valve
7	Capilary tube
8	Electronic expansion valve
9	Solenoid valve
10	Check joint
11	Stop valve for liquid line

Nº	Name of Item
12	Stop valve for gas line
13	High pressure switch for protection
14	Pressure switch for control
15	Ambient thermistor
16	Condenser pipe thermistor
17	Discharge gas thermistor
18	Indoor exchanger
19	Strainer
20	Electronic expansion valve
21	Distributor

2.5.4. Refrigerant piping selection

Select the piping connection sizes according to the following procedures:

Between outdoor unit and branch pipe: Select the same pipe connection size as the pipe size of the Outdoor unit

Between branch pipe and indoor unit: Select the same pipe connection size as the pipe size of the indoor unit

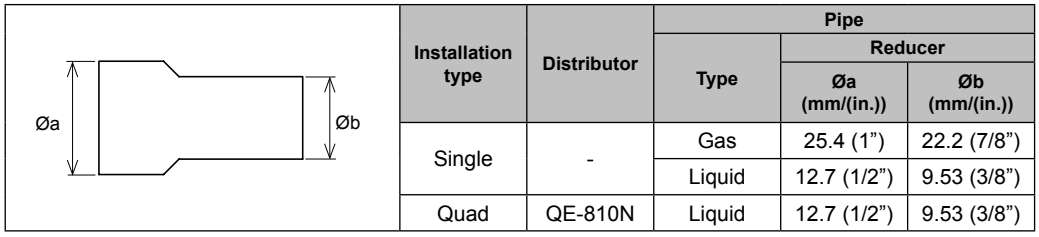
Unit	Gas piping size	Liquid piping size	Distributor	
			Twin	Quad
RASC-3HVRNE	15.88 (5/8”)	9.53 (3/8”)	TE-03N	-
RASC-5HVRNE	15.88 (5/8”)	9.53 (3/8”)	TE-56N	-
RASC-10HRNE	25.4 (1”)	12.7 (1/2”)	TE-10N	QE-810N

For RASC-10HRNE units, use a reducer pipe in the following installations:

Installation type	Distributor	Pipe		
		Type	Dimensions	
			a	b
Single	-	Gas	Ø 25.4 (1”)	Ø 22.2 (7/8”)
		Liquid	Ø 12.7 (1/2”)	Ø 9.53 (3/8”)
Twin	TE-56N	Liquid	Ø 9.53 (3/8”)	Ø 6.35 (1/4”)
Quad	QE-810N	Liquid	Ø 12.7 (1/2”)	Ø 9.53 (3/8”)

Piping size for indoor unit.

The piping size for indoor unit are as follows:



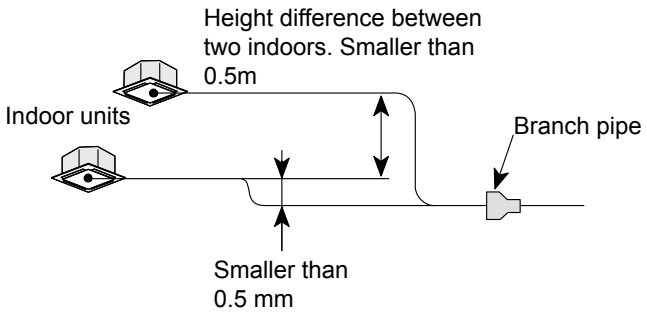
Installation type	Distributor	Pipe		
		Type	Reducer	
			Øa (mm/(in.))	Øb (mm/(in.))
Single	-	Gas	25.4 (1”)	22.2 (7/8”)
		Liquid	12.7 (1/2”)	9.53 (3/8”)
Quad	QE-810N	Liquid	12.7 (1/2”)	9.53 (3/8”)

2.6. Twin and quad system installation

2.6.1. Height difference between indoor units and distributor

Install all indoor units at the same height. When the height difference between the indoor units due to building construction is necessary, this should be less than 0,5 meters. Install the branch pipe at the same height of indoor units or lower, but never higher.

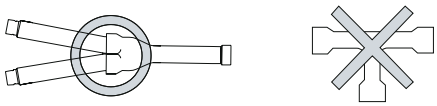
Sample: Twin system



2.6.2. Installing distributor

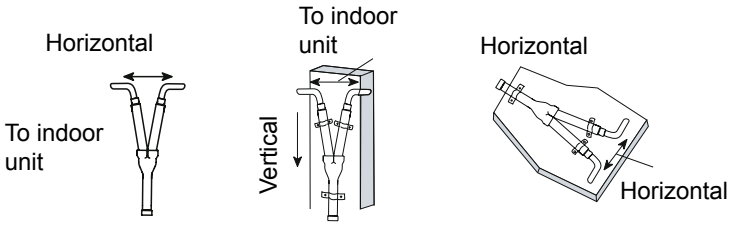
1. Install the distributor supplied by Hitachi on request A tee can not be installed instead of a branch pipe.

Sample: Twin system



2. Installing the distributor. Fix the branch pipe horizontally to the pillar, wall or ceiling. Piping must not be fixed rigidly to the wall as thermal expansion and contraction can cause pipe fracture.

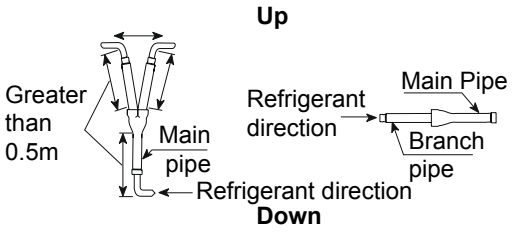
Sample: Twin system



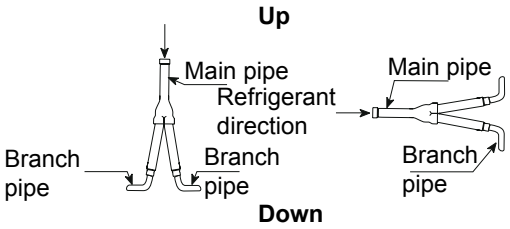
	NOTE
-	*Fix the piping from outside of insulation or inserting absorber between the pipe and a fixing metal.*

3. Correct position of twin distributor

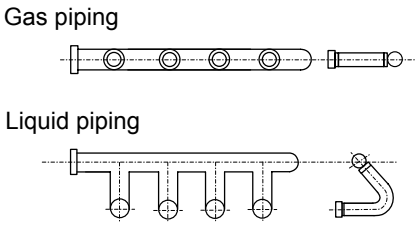
This is the correct position of twin branch pipe:



This is wrong position.



4. Correct position of quad distributor. Install the header horizontally.



- **Tightening flare nuts**

Pipe size	Tightening torque (N.m)
Ø6.35 mm	20
Ø9.53 mm	40
Ø12.70 mm	60
Ø15.88 mm	80
Ø19.05 mm	100

- **Brazing work**

	WARNING
- *Explosion risk. Can cause serious injury.* - *Use nitrogen gas for blowing during pipe brazing. Do not use oxygen, acetylene or fluorocarbon gas.* - *Use a reducer valve when nitrogen gas blowing is performed during brazing. The gas pressure should be maintained within 0.03 to 0.05 Mpa. Do not apply excessively high pressure to a pipe.*	

	NOTE
- *A lot of oxidation film will occur inside of tubes if no nitrogen gas blowing is performed during brazing work. This film will be flecked off after operation and will circulate in the cycle, resulting in clogged expansion valves, etc. This will cause bad influence to the compressor.*	

2.7. Rasc unit factory refrigerant charge (wo kg)

Rasc unit factory refrigerant charge (wo kg) is the next:

O/U MODEL	Wo Factory Charge (Kg)
RASC-3HVRNE	2.8
RASC-5HVRNE	4.0
RASC-10HRNE	9.0

	NOTE
-	*In case of the actual piping length is less than 5 m, total refrigerant quantity should be according to the table below.*

O/U MODEL	Refrigerant quantity (Kg)
RASC-3HVRNE	2.3
RASC-5HVRNE	3.3
RASC-10HRNE	7.4

2.8. Additional refrigerant charge calculation

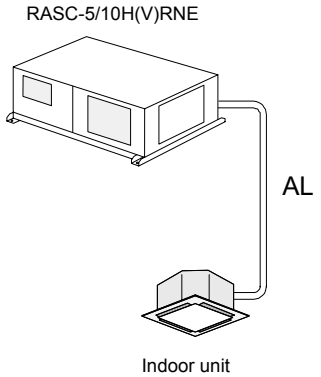
- **See the following table:**

O/U MODEL	Wo: Factory Charge (Kg)	ℓ Charge-less Length (m)	p Compensating Rate (kg/m)
RASC-3HVRNE	2.8	20	0.06
RASC-5HVRNE	4.0	30	0.06
RASC-10HRNE	9.0	30	0.12

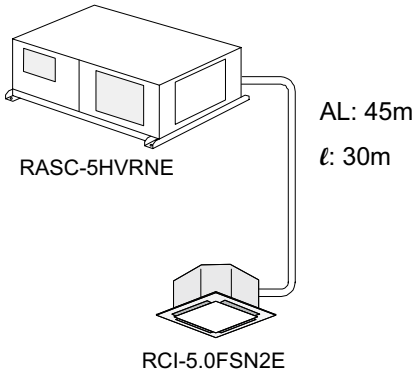
- **Single system**

Calculate piping length AL(m)

AL: Piping Length
ℓ: Charge-less piping length
(a): No additional charge is required AL≤ **ℓ**
(b): Additional charge is required AL≥ **ℓ**
W (additional charge quantity) = (AL- ℓ) x p



Example:

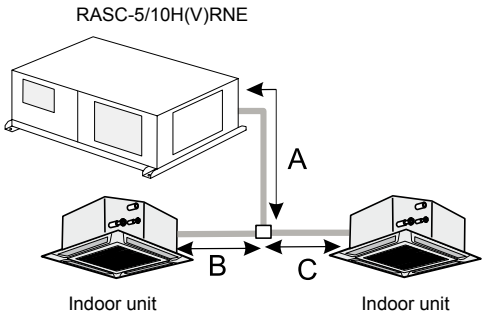


W (additional charge quantity) = (45-30) x 0.06 = 0.9 kg

- **Twin system**

Calculate piping length AL(m) AL= A + B + C

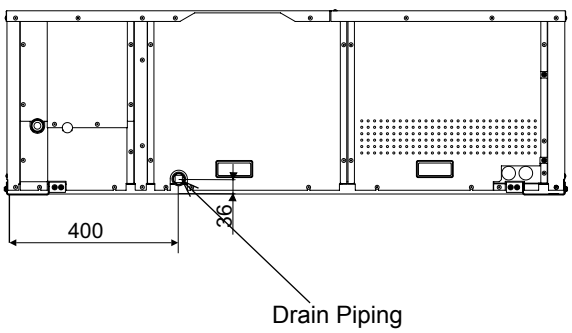
AL: A+B+C
ℓ: Charge-less piping length
W (additional charge quantity) = (AL- ℓ) x p



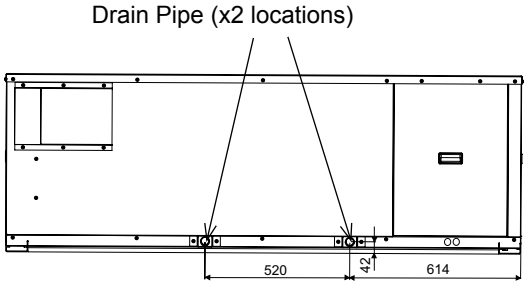
2.9. Drain piping

1. Drain pipe location is indicated in the below figures.

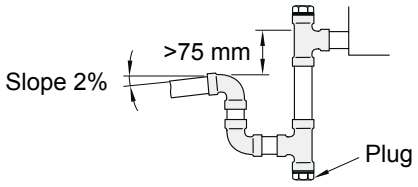
RASC-(3/5)HVRNE



RASC-10HRNE



2. Connect a siphon as shown in the figure below. Pay special attention when connecting it to the unit (proper installation work is needed in order to guarrantee connection pipes matching).



3. Fasten the siphon to the drain hose with an adhessive and a field-supplied clamp.
4. Prepare a draining pipe of 25 OD (outer diameter) for the draining line which shall be performed by a down slope of 2 %.
5. Check to ensure that the water drains smoothly by pouring some water into the drain pan.
6. Check to ensure that the water do not remain in the drain pan.
7. Check the drain connections periodically (once a year) in order to detect water leakage.

	NOTE
	- If the unit is installed in a cold area, the drain water may freeze. Install an electric heater (field-supplied) at the drain connection.

3. Electrical Wiring

This chapter describes the procedures to carry out the electrical wiring connections for outdoor units.

Contents

3. Electrical wiring 51

3.1. General check 52

3.2. Electrical wiring for outdoor units 53

3.2.1 Electrical wiring connection for outdoor units 53
3.2.2. Setting of DIP switches for outdoor unit 54

3.3. Electrical wiring between indoor unit and outdoor unit 57

3.4. Wire size 58

3.5. Electrical wiring diagrams 60

3.5.1. Electrical wiring diagram for RASC-(3/5)HVRNE 60
3.5.2. Electrical wiring diagram for RASC-10HRNE 61

3.1. General check

	DANGER

- *Electrical hazard. Can cause serious injuries or death.*
- *Do not connect or adjust any wiring or connections unless the main power switch is OFF.*
- *Check that the earth wire is securely connected, tagged and locked in accordance with national and local codes.*
- *Check and test to ensure that if there is more than one source of power supply, that all are turned OFF.*
- *Check to ensure that the indoor fan and the outdoor unit have stopped before electrical wiring work or periodical check is performed.*
- *Check to ensure that the screws of the terminal block are tightly tightened.*

	CAUTION

- *Damage to wires. Risk of fire.*
- *Protect the wires, drain pipe and electrical parts from rats or other small animals. If not protected, rats may damage unprotected parts.*
- *Wrap the accessory packing around the wires, and plug the wiring connection hole with the seal material to protect the product from any condensed water and insects.*
- *Tightly secure the wires with the cord clamp inside the indoor unit.*
- *Lead the wires through the knockout hole in the side cover when using conduit.*
- *Secure the cable of the remote control switch with the cord clamp inside the electrical box.*
- *Electrical wiring must comply with national and local codes. Contact your local authority in regards to standards, rules, regulations, etc.*
- *Check that the ground wire is securely connected.*
- *Electrical hazard. Risk of fire. Connect a fuse of specified capacity.*

	NOTE

- *In case of performing a test run operation take especially care because some security features are disabled: the units will operate during 2 hours without Thermo-OFF, and the 3-minute guard for compressor protection will not be effective during the test.*
- *Fix rubber bushes with an adhesive on the panel when the conduit pipes to the outdoor unit are not used.*
- *In forced stopped compressor mode, the compressor operation is OFF.*

1. Ensure that the field-supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated. Make sure that they comply with national and regional electrical codes.

2. Following the Council Directive 2004/108/EC(89/336/EEC), relating to electromagnetic compatibility, as the next table indicates. Maximum permissible system impedance Zmax at the interface point of the user's supply, in accordance with EN61000-3-11:

MODEL	Zmax (Ω)
RASC-3HVRNE	0.26
RASC-5HVRNE	0.19
RASC-10HRNE	*0.20*

3. Harmonics situation of each model regarding IEC 61000-3-2 and IEC 61000-3-12 is as follows:

MODELS SITUATION REGARDING IEC 61000-3-2 AND IEC 61000-3-12 Ssc "xx"	MODELS(*)	Ssc "xx" (KVA)
Equipment complying with IEC 61000-3-12	RASC-3HVRNE RASC-5HVRNE	-
This equipment complies with IEC 61000-3-12 provided that the short-circuit power Ssc is greater than or equal to xx (see Ssc column) at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power Ssc greater than or equal to xx (see Ssc column)		
Installation restrictions may be applied by supply authorities in relation to harmonics	RASC-10HRNE	-
This(ese) unit(s) is(are) out of scope of IEC 61000-3-12	-	-

4. Check to ensure that the power supply voltage is within +/-10% of the rated voltage.

5. Check to ensure that power supply has an impedance low enough to warranty not reduce the starting voltage more than 85% of the rated voltage.

6. Check to ensure that the ground wire is connected.

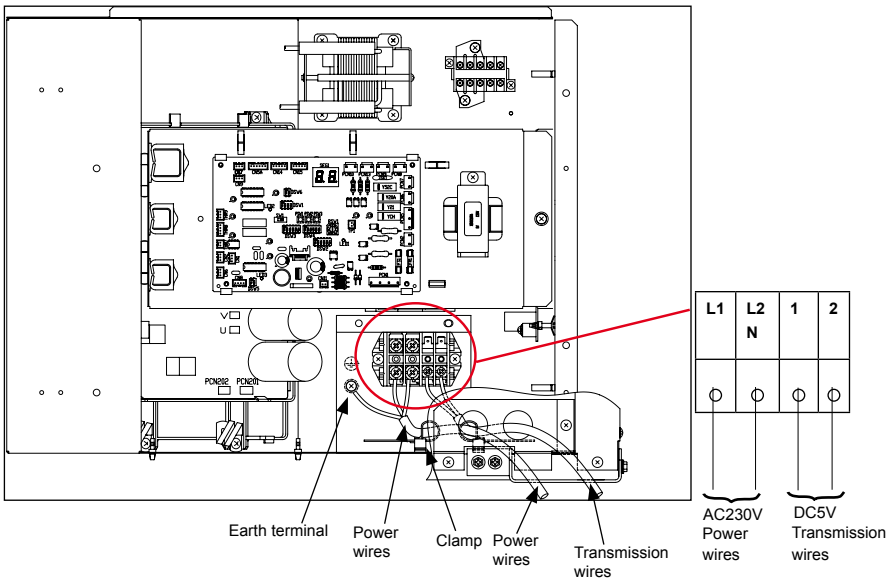
7. Connect a fuse of specified capacity.

3.2. Electrical wiring for outdoor units

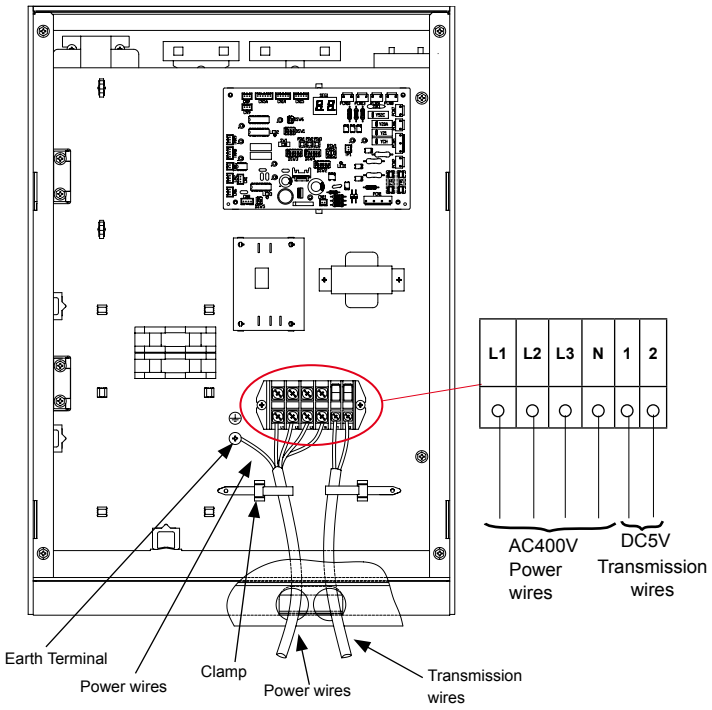
3.2.1 Electrical wiring connection for outdoor units

The electrical wiring connection for the outdoor unit is as shown below:

- **RASC-(3/5)HVRNE**



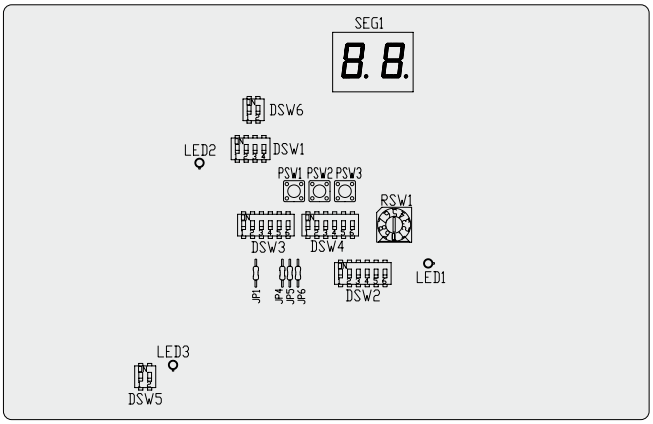
- **RASC-10HRNE**



3.2.2. Setting of DIP switches for outdoor unit

- **Quantity and location of DIP switches**

The PCB in the outdoor unit is operating with 5 types of DIP switches, 1 slide switch and 3 push switches. The location is as follows:



	NOTE
- *The mark "■" indicates position of dips switches. Figures show setting before shipment or after selection.* - *Before setting dips switches, firstly turn off power source and set the position of the dips switches. If the switches are set without turning off the power source, the contents of the setting are invalid.*	

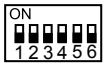
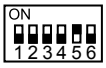
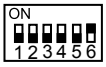
- **DSW1: Test run**

Function	Setting position	Remarks
Setting before shipment		
Test run for cooling		Continuous operation during 2 hours is performed without thermo OFF. The 3 minutes guard for compressor protection is not effective during the test run operation.
Test run for heating		
Forced stop of compressor (1)		The compressor is OFF during this operation

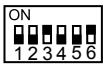
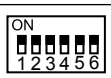
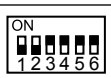
	NOTE

- *It is possible to select the cancellation of the outdoor hot start control by pushing both PSW1 & PSW3 simultaneously during 3 seconds.*
- *This operation is reset once the compressor is in Thermo-ON mode.*
- *The cancellation of the outdoor hot start control configuration could damage the compressor if it is usually used. In that case the unit warranty will be void.*

- **DSW2: Piping length/selection function**

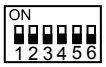
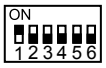
Function	Setting position	Remarks
Setting before shipment		
Function selection setting		Function selection is set by PSW
External input/output selection		External input/output selection is set by PSW

- **DSW3: Capacity setting**

Unit	Setting position	Remarks
RASC-3HVRNE		No setting is required
RASC-5HVRNE		
RASC-10HRNE		

- **DSW4 / RSW1: Refrigerant cycle setting**

  In case of using an H-Link II net it is required to set the refrigerant cycle number.

	Setting position (DSW4)		Setting position (RSW1)
Setting for tens (second digit)		Setting for units (first digit)	
Example for 16		and	

Rotary switches' positions (RSW1) are set by inserting a screw driver into the groove.

- **DSW5: Transmission setting of end terminal resistance**

Function	Setting position	Remarks
Setting before shipment		Setting before shipment: pin # 1 setted ON. In case of having 2 or more RASC units connected to the same H-Link, set for the second unit, pin #1 OFF. If only one RASC unit is used, no setting is required.
Cancellation		

- **DSW6: Power source setting**

Function	Setting position	Remarks
RASC-(3/5)HVRNE 220~240V (setting before shipment)		No setting is required
RASC-10HRNE 380~415V (setting before shipment)		

- **Jumper setting**

Jumper	Function	Remarks
JP1	Cut: Anual cooling mode	-
JP5	Cut: Simultaneous defrost prevention	

3.3. Electrical wiring between indoor unit and outdoor unit

Connect the electrical wires between the indoor unit and the outdoor unit, as shown below.

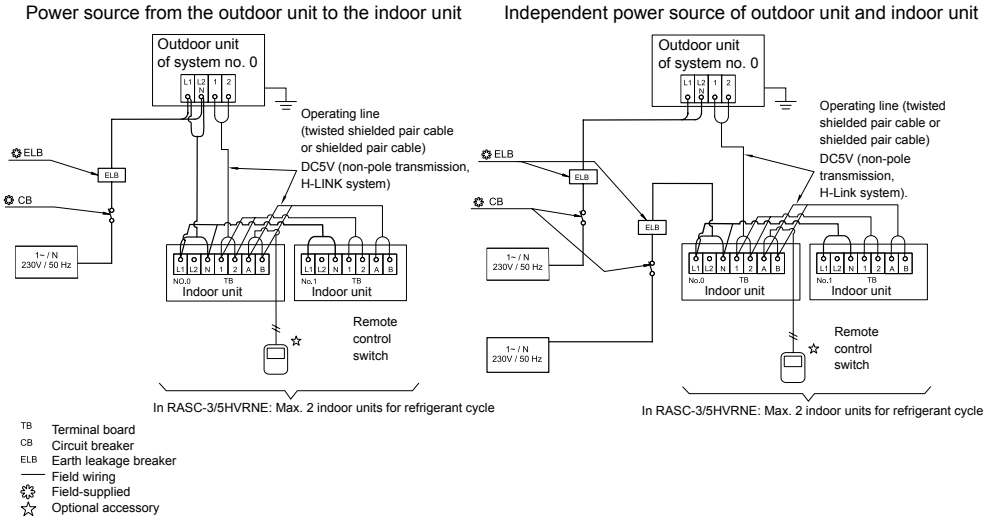
Check to ensure that the terminal for power source wiring (terminals “L1” to “L1” and “N” to “N” of each terminal board: AC230V), and intermediate wires (Operating line: terminals “1” to “1” and “2” to “2” of each terminal board: DC5V) between the indoor unit and the outdoor unit are connected correctly. If not, some component will be damaged.

- Follow local codes and regulations when performing electrical wiring.
- Connect the operation wiring to the units in the same refrigerant cycle (The refrigerant piping and the control wiring should be connected to the same indoor units). If the refrigerant piping and the control wiring are connected to the units in the different refrigerant cycle, it may cause a abnormal operation.Use twist pair wire (more than 0.75 mm²) for operation wiring between outdoor unit and indoor unit, and operation wiring between indoor units (H-Link connection). It can be also used shielded pair wiring. Shield shall be connected to earth only in one cable side.
- Use shielded wires for intermediate wiring to protect the units from noise obstacle at length of less than 300 m and size complied with local code.
- Do not use more than 3 cores for operation wiring (H-Link). Core sizes must be selected according to the national regulations.
- Open a hole near the connection hole of power source wiring when multiple outdoor units are connected from one power source line.
- The recommended breaker sizes are shown in Table of electrical data and recommended Wiring, Breaker Size/1 O.U.
- In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the panel.
- All the field wiring and equipment must comply with local and international codes.

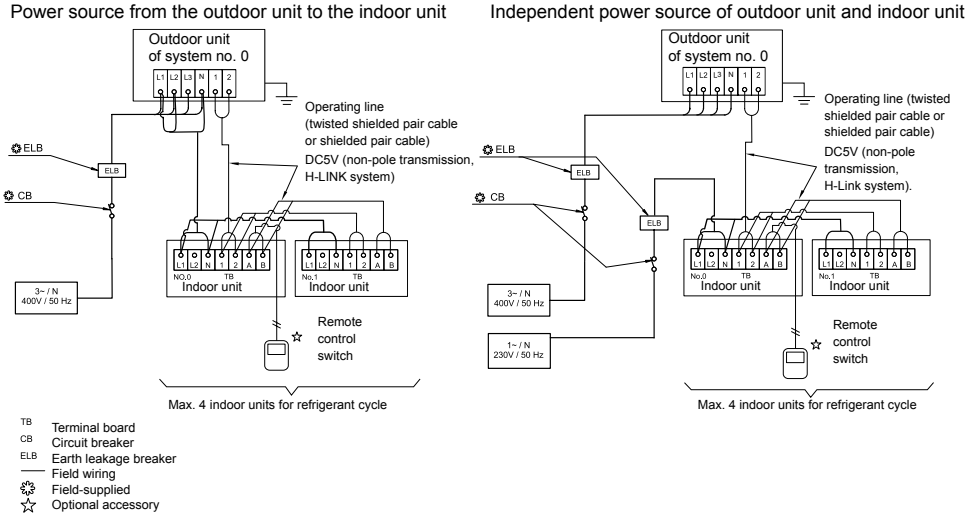
	CAUTION
- *Electrical hazard. Can cause serious injuries. All the field wiring and electrical components must comply with local codes.*	

	NOTE
- *Incorrect wiring. Possible failure of PCB. Pay attention to the connection of the operating line.*	

- **RASC-(3/5)HVRNE**


Power source from the outdoor unit to the indoor unit
Independent power source of outdoor unit and indoor unit
Outdoor unit of system no. 0
Operating line (twisted shielded pair cable or shielded pair cable)
DC5V (non-pole transmission, H-LINK system)
DC5V (non-pole transmission, H-Link system).
ELB
CB
1~ / N 230V / 50 Hz
Indoor unit
Remote control switch
In RASC-3/5HVRNE: Max. 2 indoor units for refrigerant cycle
TB Terminal board
CB Circuit breaker
ELB Earth leakage breaker
Field wiring
Field-supplied
Optional accessory

- **RASC-10HRNE**


Power source from the outdoor unit to the indoor unit
Independent power source of outdoor unit and indoor unit
Outdoor unit of system no. 0
Operating line (twisted shielded pair cable or shielded pair cable)
DC5V (non-pole transmission, H-LINK system)
DC5V (non-pole transmission, H-Link system).
ELB
CB
3~ / N 400V / 50 Hz
1~ / N 230V / 50 Hz
Indoor unit
Remote control switch
Max. 4 indoor units for refrigerant cycle
TB Terminal board
CB Circuit breaker
ELB Earth leakage breaker
Field wiring
Field-supplied
Optional accessory

3.4. Wire size

- Recomended minimum sizes for field provided wires:

Model	Power source	Max. Current	Power source cable size		Transmitting cable size	
			EN60 335-1 ❶	MLFC ❷	EN60 335-1 ❶	MLFC ❷
All indoor units(*)	1~ 230V 50Hz	5 A	0.75 mm²	0.5 mm²	0.75 mm²	0.5 mm²
RPI-8/10		10 A	1.5 mm²			
RASC-3HVRNE	1~ 230V 50Hz	28 A	6 mm²	3.5 mm²		
RASC-5HVRNE	1~ 230V 50Hz	37 A	10 mm²	5.5 mm²		
RASC-10HRNE	3N~ 400V 50Hz	33 A	10 mm²	5.5 mm²		
(*) Except RPI-8/10						

- The wire sizes marked in the table with ❶ are selected by 125% of the maximum current of the unit according to the European Standard, EN60 335-1.

- The wire sizes marked in the table with ❷ are selected by 125% of the maximum current of the unit according to the wire, MLFC (Flame Retardant Polyflex Wire) manufactured by HITACHI Cable Ltd. Japan.

- In case that the power wires are connected in series, add each unit maximum current and select the wire size according to the next table:

Selection according to EN60 335-1		Selection according to MLFC (at cable Temp. Of 60 ºC)	
Current i (A)	**Wire Size (mm²)**	**Current i (A)**	**Wire Size (mm²)**
I ≤ 6	0.75	I ≤ 15	0.5
6 < i ≤ 10	1	15 < i ≤ 18	0.75
10 < i ≤ 16	1.5	18 < i ≤ 24	1.25
16 < i ≤ 25	2.5	24 < i ≤ 34	2
25 < i ≤ 32	4	34 < i ≤ 47	3.5
32 < i ≤ 40	6	47 < i ≤ 62	5.5
40 < i ≤ 63	10	62 < i ≤ 78	8
63 < i	❸	78 < i ≤ 112	14
		112 < i ≤ 147	22

❸ In case that current exceeds 63 A do not connect cables in series

NOTE

- *Follow local codes and regulations when selecting field wires, circuit breakers and earth leakage breakers.*
- *Use the wires which are not lighter than the ordinary polychloroprene sheathed flexible cord (code designation H05RN-F).*
- *Use shielded wires for transmission between indoor and outdoor units, and connect the shielded part to the earth screw in the electrical box of the indoor unit as shown below.*

- Select the main switches in according to the next table:

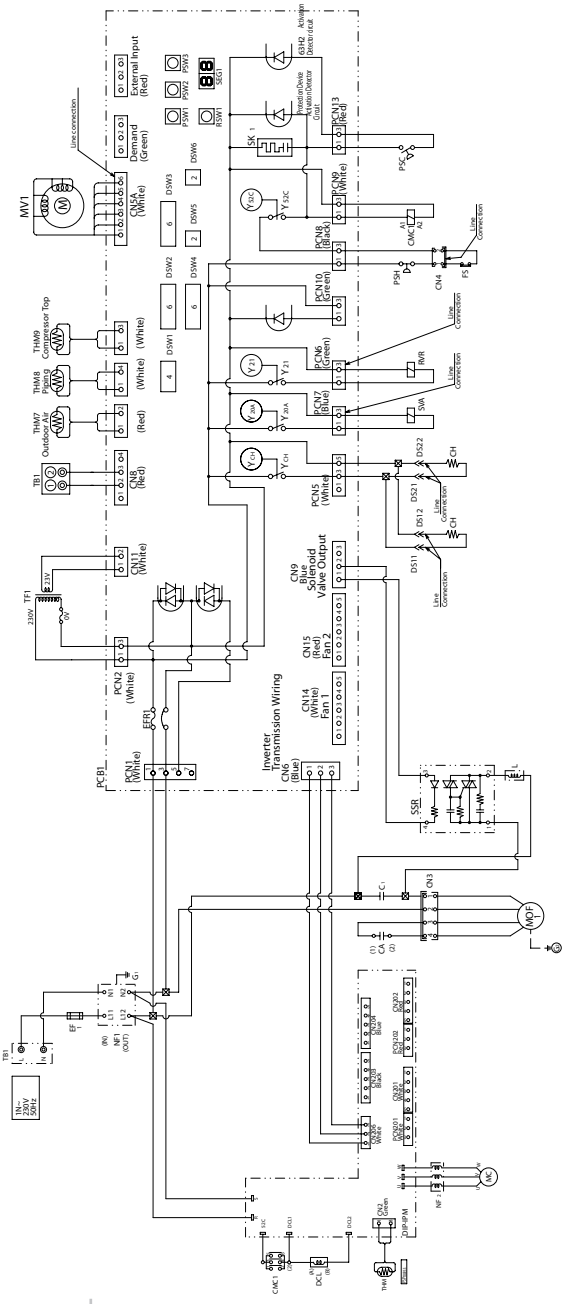
Model	Power source	Max. Current	CB	ELB (no. poles/A/mA)
All Indoor Units (*)	1~ 230V 50Hz	5A	6A	2/40/30
RPI-8/10	1~ 230V 50Hz	10A	10A	
RASC-3HVRNE	1~ 230V 50Hz	28A	40A	
RASC-5HVRNE		37A	50A	2/63/30
RASC-10HRNE	3N~ 400V 50Hz	33A	40A	*(informed later)*

ELB: Earth switch; CB: Switch; (*) Except RPI-8/10HP

3.5. Electrical wiring diagrams

3.5.1. Electrical wiring diagram for RASC-(3/5)HVRNE

Mark	Part Name	Remarks
MC1	Motor for Compressor	
MOF1	Motor (Fan)	
EF1	Power Fuse	
CMC1	Electromagnetic Contactor (Compressor)	
SVA	Solenoid Valve (Gas Pipe)	
RVR	Reversing Valve Relay	
MV1	Electronic Expansion Valve	
TB1	Terminal Board	
G1,2	Earth	
TF1	Transformer	
Y_CH	Auxiliary Relay (Oil Heater)	DC Coil
Y_20A	Auxiliary Relay (Solenoid Valve)	DC Coil
Y_21	Auxiliary Relay (Solenoid 4-Way Valve)	DC Coil
Y_52C	Auxiliary Relay (Compressor)	DC Coil
THM7	Thermistor (Outdoor air)	
THM8	Thermistor (Piping)	
THM9	Thermistor (Compressor top)	
THM	Fin Thermistor	
PSH	High Pressure Switch for Protection	
PSC	Pressure Switch for control	
DCL	Reactor	
CA	Condenser	
DIP-IPM	Inverter Module	
PCB1	Control PCB	
SSR	Thyristor	
NF1,2	Noise Filter	
EFR1	Fuse	On PCB1
PSW1	Switch Forced defrosting	On PCB1
PSW2	Switch Checking	On PCB1
PSW3	Switch Checking	On PCB1
DSW1	Switch Test Run	On PCB1
DSW2	Switch Auxiliary Function Setting	On PCB1
DSW3	Switch Outdoor Capacity Setting	On PCB1
DSW4	Switch Refrigerant Setting	On PCB1
DSW5	Switch	On PCB1
C1	Condenser	
L	Coil	
CH	Crankcase Heater	
FS	Float Switch	
DS1,DS2	I.F.Connector	



Arrangement of Electric Parts in Electrical control Box

Disposal of Electric Parts in RASC Unit

Setting Position of Dip Switch (Factory setting)

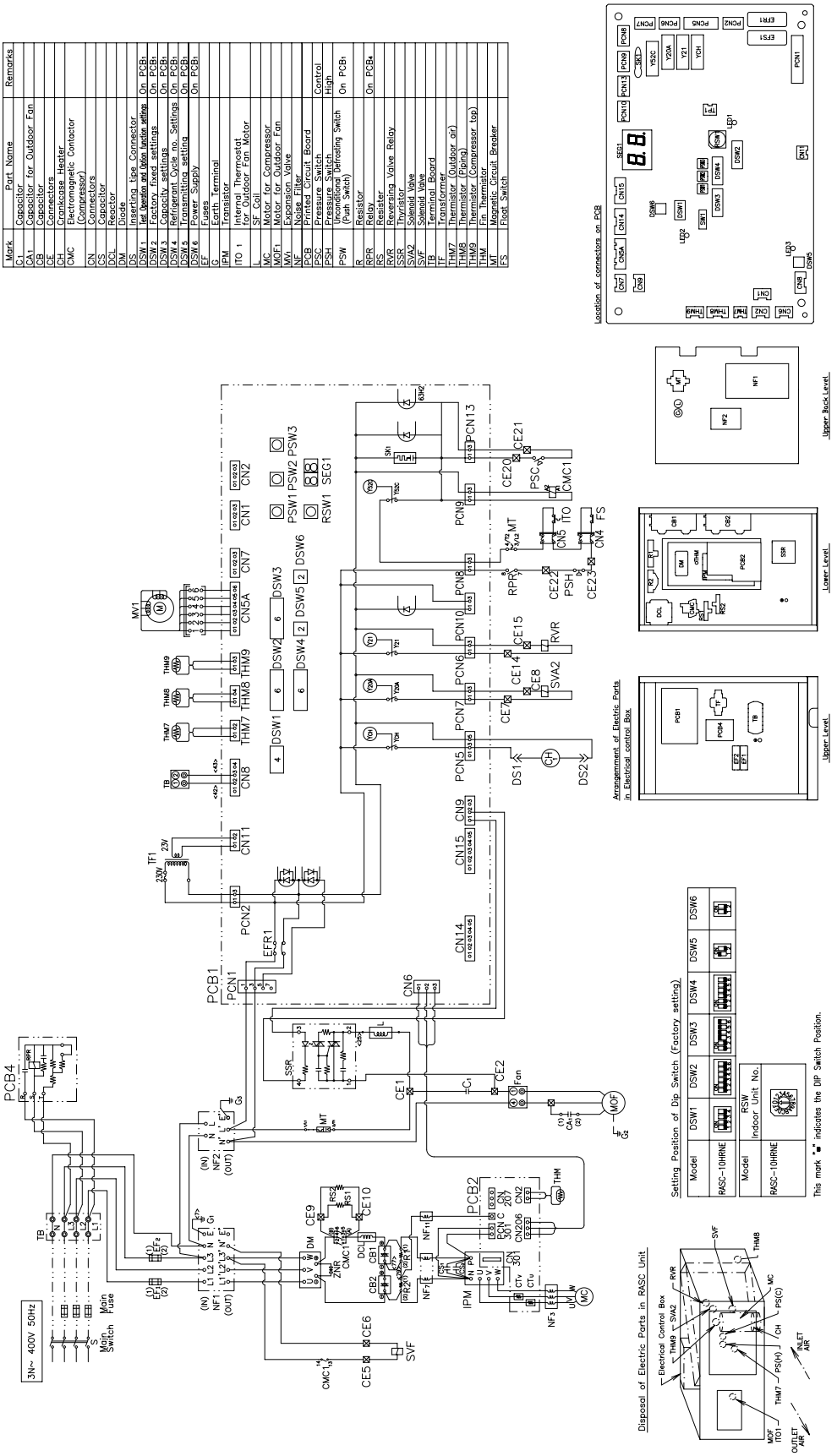
	DSW1	DSW2	DSW3	DSW4	DSW5	DSW6
RASC-3HVRNE	ON 1 2 3 4	ON 1 2 3 4 5 6	ON 1 2 3 4 5 6	ON 1 2 3 4 5 6	ON 1 2	ON 1 2
RASC-5HVRNE	ON 1 2 3 4	ON 1 2 3 4 5 6	ON 1 2 3 4 5 6	ON 1 2 3 4 5 6	ON 1 2	ON 1 2

■ This side of the maked indicates the DIP Switch Position.

Location of connectors on PCB

3

3.5.2. Electrical wiring diagram for RASC-10HRNE



4. Control System

This chapter presents the control system flowcharts for the H(V)RNE RASC series and the complete range of the Hitachi indoor units.

Contents

4. Control system 63

4.1. Device control system 64

4.2. RASC-(3~10)H(V)RNE PCB 66

4.3. Protection and safety control 67

4.4. Standard operation sequence 68

4.4.1. Cooling operation 68
4.4.2. Dry operation 70
4.4.3. Heating operation 72
4.4.4. Defrost operation control 74

4.5. Standard control functions 75

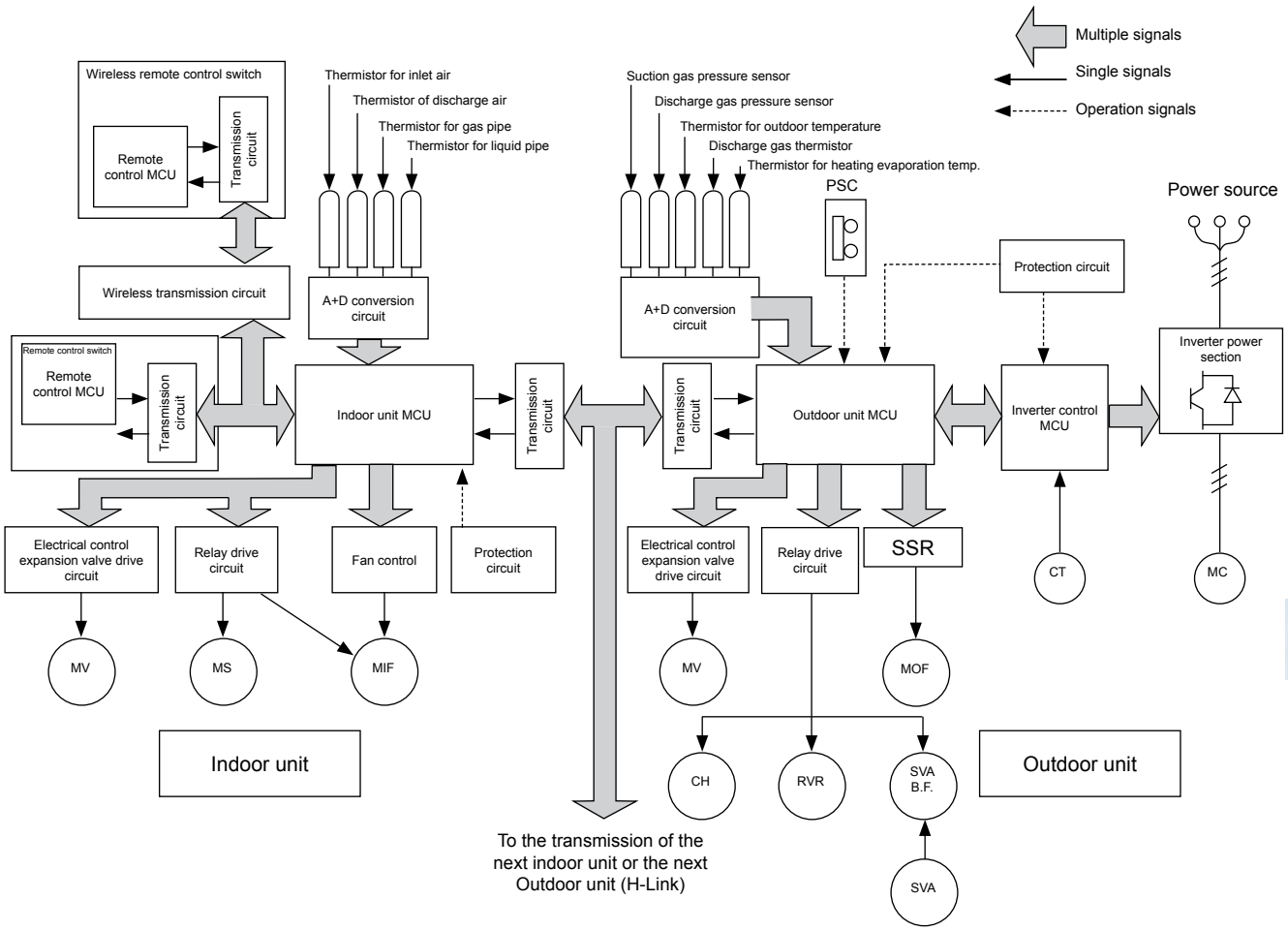
4.5.1. Freezing protection during cooling process or dry operation 75
4.5.2. Prevention control for excessively high discharge gas temperature 76
4.5.3. Outdoor unit electrical expansion valve control 77
4.5.4. Activation of protection device control 78
4.5.5. Outdoor Unit fan control during cooling operation 79
4.5.6. Outdoor unit fan control during heating operation 80
4.5.7. Preheating control of compressor 81
4.5.8. Prevention control for high pressure increase 81

4.1. Device control system

Control subject	Purpose		
	Cooling operation	Heating operation	Defrost operation
Control frequency of inverter compressor	The frequency control is determined with the next parameters: - Ratio (I.U. capacity/RASC capacity) - Temperature difference between air inlet temperature and setting air temperature.	The frequency control is determined with the next parameters: - Ratio (I.U. capacity/RASC capacity) - Temperature difference between air inlet temperature and setting air temperature.	Fixed frequency (stop compressor during 30 sec. After defrosting condition was completed.
Opening degree expansion valve of RASC	Fully open	- Control range of expansion valve opening degree is determined to optimize temperature. on the top of compressor. - When number of I.U. is decreased, determined with I.U. capacity. Ratio of (before/after decrease or with above condition).	Fully open
Opening degree expansion valve of indoor unit	- Control range of expansion valve opening degree is determined to optimize I.U. gas pipe temp. (Tg) - I.U. liquid pipe temp. (Tl) difference. - The expansion valve opening degree is controlled according to the number of connected I.U.	- Specified opening degree at normal control starting. Afterward, controlled to optimize I.U. liquid pipe temp. (Tl) - The expansion valve opening degree is controlled according to the number of connected I.U..	Specified opening degrees controlled by temp. on the top of compressor. (Td).
Outdoor unit fan	- Fan step is operated for RASC liquid pipe temp. (Te) stabilization control- increased number of I.U.: step-up decreased number of I.U.: step-down	- Fan Step is controlled according to RASC liquid pipe temp. and temp. on the top of compressor. - Increased number of I.U.: step-up decreased number of I.U.: step-down (limited the lowest by outdoor temp.)	Fan stop.
4-Way valve (RVR)	OFF	ON	OFF
Solenoid valve (SVA) (By-Pass valve)	- Turn ON for 1 min. at starting and after compressor thermo-ON. - Turn ON at pressure control switch activation. (RASC-(3~10)H(V)RNE)	- Turn ON for 1 min. at starting and after compressor thermo-ON. - Turn ON at pressure control switch activation. (RASC-(3~10)H(V)RNE)	Turn OFF at defrosting
Solenoid Valve (SVF) (Oil return)	Turn ON at compressor operation (RASC-10HRNE)	Turn ON at compressor operation (RASC-10HRNE)	-

I.U.: Indoor unit
Tc / Te: Condensing temperature / Evaporating temperature
Td: Discharge temperature
Tl: Liquid temperature
Tg: Gas temperature
Cap: Capacity
Temp.: Temperature

The figure below shows the outline of the control system



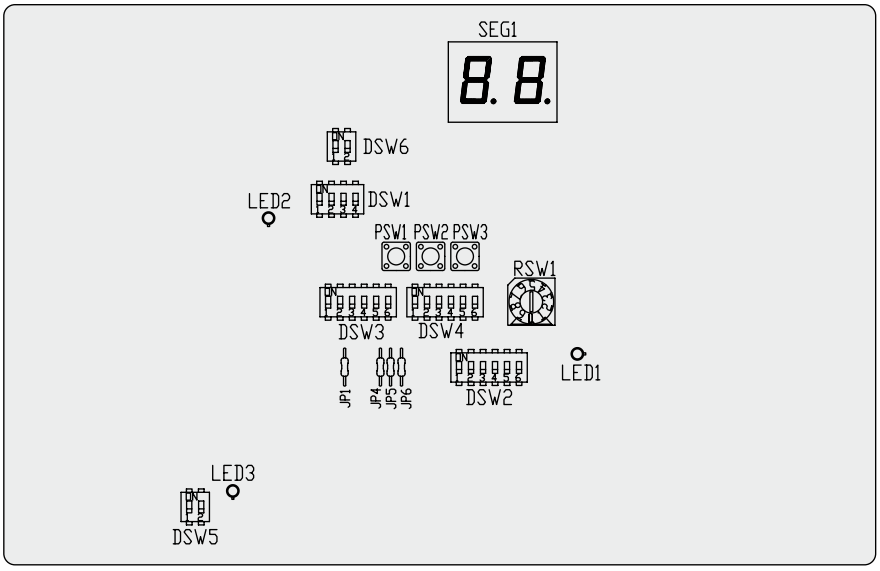
Symbol	Name
MC	Motor (for compressor)
MIF	Motor (for indoor fan)
MOF	Motor (for outdoor fan)
MS	Motor (for auto-louver)
MV	Electronic expansion valve
CMC	Compressor magnetic contactor

Symbol	Name
CH	Crankcase heater
CT	Current transformer
RVR	4-Way valve
SVA	Solenoid valve
PSC	Pressure switch for control
SSR	Solid state relay (Thyristor control)

4.2. RASC-(3~10)H(V)RNE PCB

PCB drawing

The PCB in the outdoor unit is operating with 6 types of DIP switches, 1 rotary switch and 3 push switches. The location is as follows:



Switch indication	
DSW1	Test run
DSW2	Piping length and selection function
DSW3	Capacity setting
DSW4 & RSW1	Ref. cycle number setting
DSW5	End terminal resistace setting
DSW6	Power source setting

LED and jumper indication		
LED1	Red	This LED indicates the transmission status between the indoor unit and the RCS
LED2	Yellow	This LED indicates the transmission status between the indoor unit and the outdoor unit
LED3	Green	Power source for the PCB
JP1	Annual cooling	
JP2	Release phase detection	
JP3	Self-diagnosis	
JP4	Fix cooling mode	
JP5	Alternative defrosting mode	
JP6	Control for existing piping	

NOTE

- *The mark "■" indicates position of dips switches. Figures show setting before shipment or after selection.*
- *Not mark "■" indicates pin position is not affecting.*
- *Before setting dips switches, firstly turn off power source and set the position of the dips switches. If the switches are set without turning off the power source, the contents of the setting are invalid.*

4.3. Protection and safety control

Compressor and fan motor protections

The following devices and their combinations protect the compressor and fan motor.

High-pressure switch	This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.
Oil heater	This band heater protects against the oil carry-over during the cold starting, as the band heater is energized while the compressor is stopped.
Fan motor protection	Internal thermostat that is embedded in the fan motor winding: this internal thermostat cuts out the operation of the fan motor when the temperature of the fan motor winding exceeds the setting.

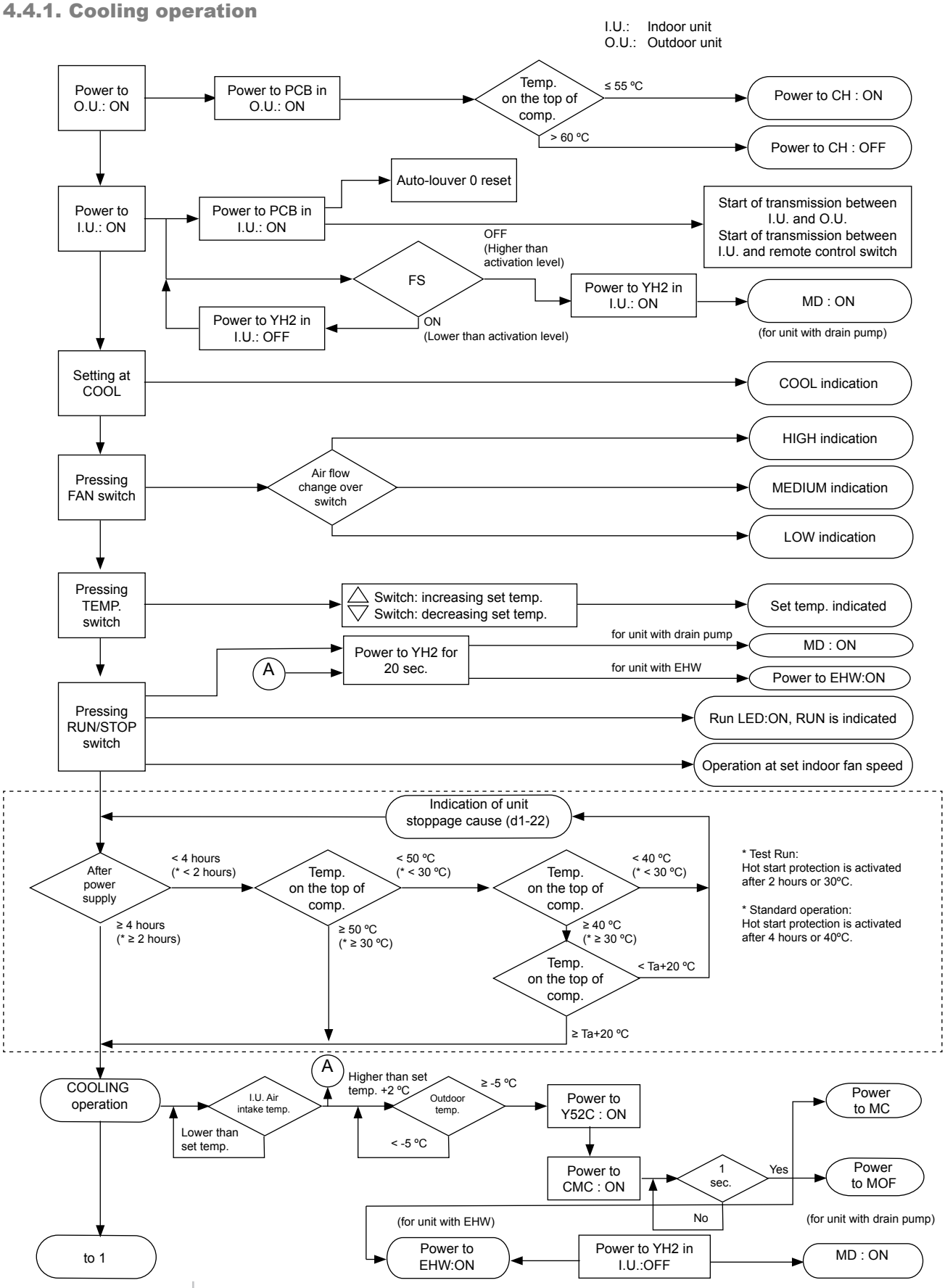
RASC Safety and control device setting

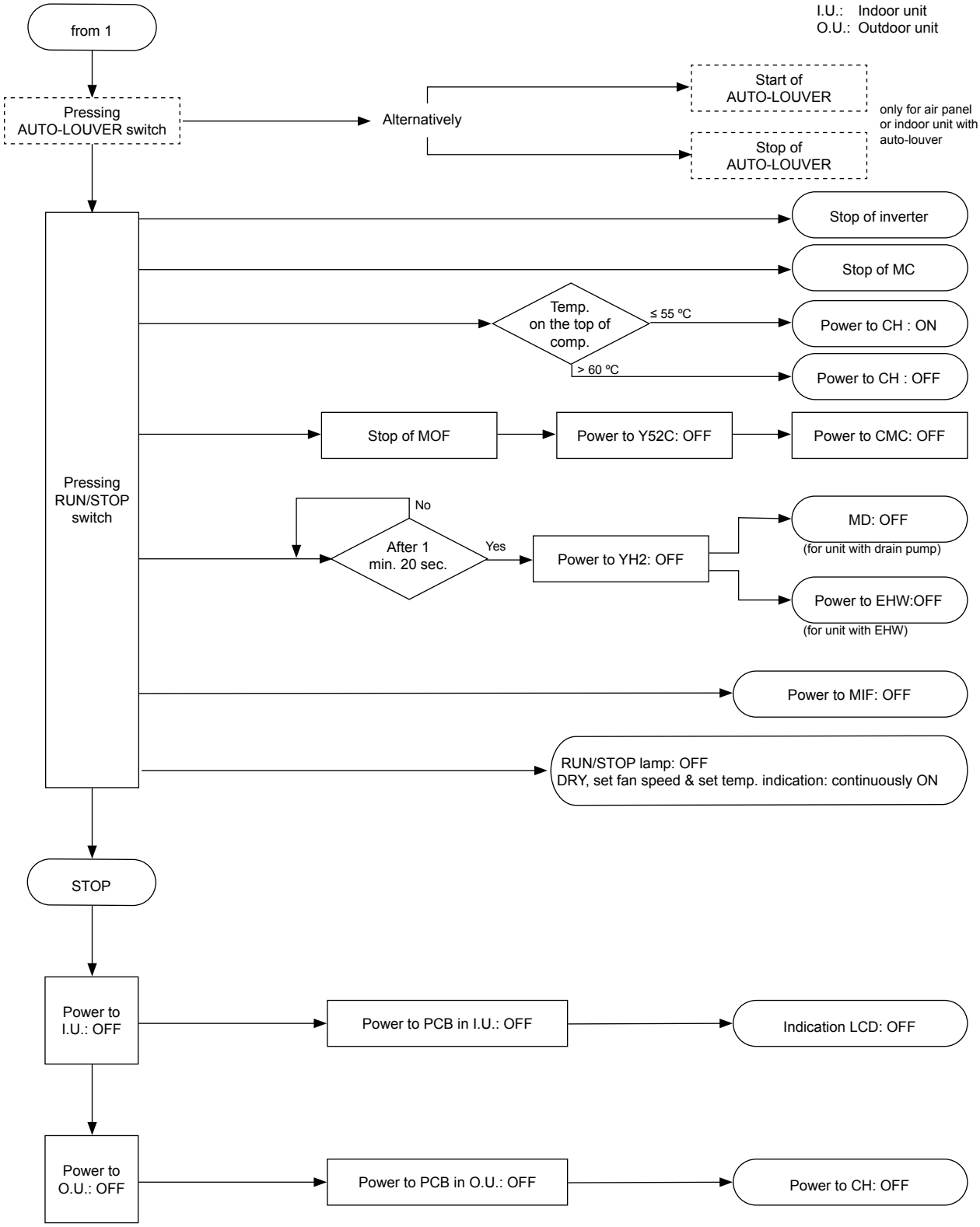
Model			RASC-3HVRNE	RASC-5HVRNE	RASC-10HRNE
High pressure switch for compressor	Cut-out	MPa	$^{-0.05}_{-0.15}$ 4.15	$^{-0.05}_{-0.15}$ 4.15	$^{-0.05}_{-0.15}$ 4.15
	Cut-in	MPa	$^{\pm 0.15}$ 3.20	$^{\pm 0.15}$ 3.20	$^{\pm 0.15}$ 3.20
Pressure switch for by-pass	Cut-out	MPa	$^{+0.01}_{-0.01}$ 2.85	$^{+0.01}_{-0.01}$ 2.85	$^{+0.01}_{-0.01}$ 2.85
	Cut-in	MPa	$^{0}_{-0.15}$ 3.60	$^{0}_{-0.15}$ 3.60	$^{0}_{-0.15}$ 3.60
Fuse	1~ 230V 50Hz	A	40	50	-
	3N~ 400V 50Hz	A	-	-	40x2
Cranckcase heater	Output	W	40x2	40x2	40x1
CCP timer		-	Non-adjustable		
Setting time		min.	3	3	3
Fan motor fuse		A	10	10	12 (MCB)
Internal thermostat	Cut-out	ºC	130	130	145
	Cut-in	ºC	60~110	60~110	70

MCB: Magnetic Circuit Breaker

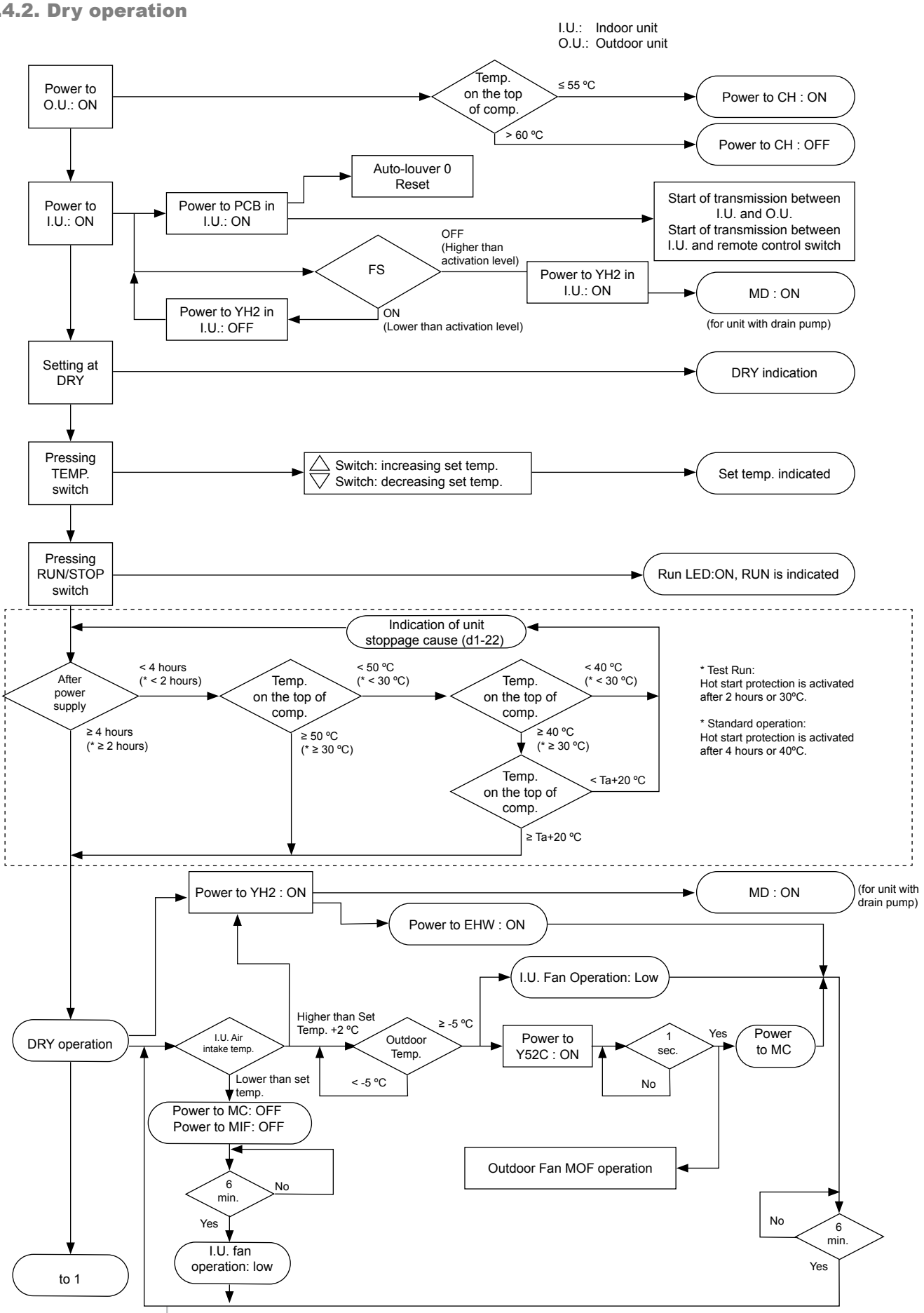
4.4. Standard operation sequence

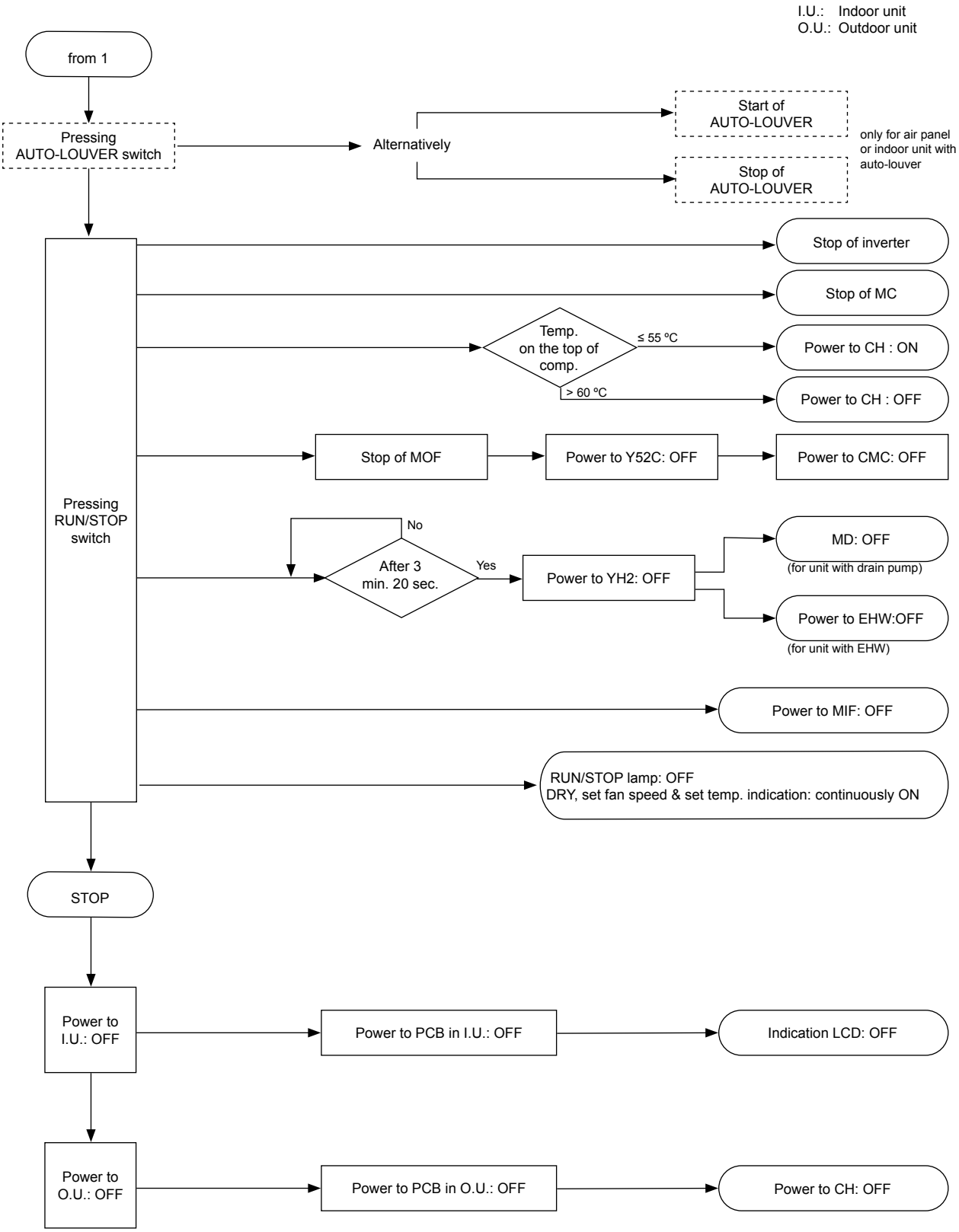
4.4.1. Cooling operation


I.U.: Indoor unit
O.U.: Outdoor unit
Power to O.U.: ON
Power to PCB in O.U.: ON
Temp. on the top of comp.
≤ 55 ºC
> 60 ºC
Power to CH : ON
Power to CH : OFF
Power to I.U.: ON
Power to PCB in I.U.: ON
Auto-louver 0 reset
Start of transmission between I.U. and O.U.
Start of transmission between I.U. and remote control switch
OFF
(Higher than activation level)
FS
Power to YH2 in I.U.: ON
MD : ON
(for unit with drain pump)
Power to YH2 in I.U.: OFF
ON
(Lower than activation level)
Setting at COOL
COOL indication
Pressing FAN switch
Air flow change over switch
HIGH indication
MEDIUM indication
LOW indication
Pressing TEMP. switch
Switch: increasing set temp.
Switch: decreasing set temp.
Set temp. indicated
for unit with drain pump
MD : ON
A
Power to YH2 for 20 sec.
for unit with EHW
Power to EHW:ON
Pressing RUN/STOP switch
Run LED:ON, RUN is indicated
Operation at set indoor fan speed
Indication of unit stoppage cause (d1-22)
After power supply
< 4 hours (* < 2 hours)
≥ 4 hours (* ≥ 2 hours)
Temp. on the top of comp.
< 50 ºC (* < 30 ºC)
≥ 50 ºC (* ≥ 30 ºC)
Temp. on the top of comp.
< 40 ºC (* < 30 ºC)
≥ 40 ºC (* ≥ 30 ºC)
Temp. on the top of comp.
< Ta+20 ºC
≥ Ta+20 ºC
* Test Run:
Hot start protection is activated after 2 hours or 30ºC.
* Standard operation:
Hot start protection is activated after 4 hours or 40ºC.
COOLING operation
I.U. Air intake temp.
Lower than set temp.
A
Higher than set temp. +2 ºC
Outdoor temp.
≥ -5 ºC
< -5 ºC
Power to Y52C : ON
Power to CMC : ON
1 sec.
Yes
No
Power to MC
Power to MOF
(for unit with drain pump)
(for unit with EHW)
Power to EHW:ON
Power to YH2 in I.U.:OFF
MD : ON
to 1

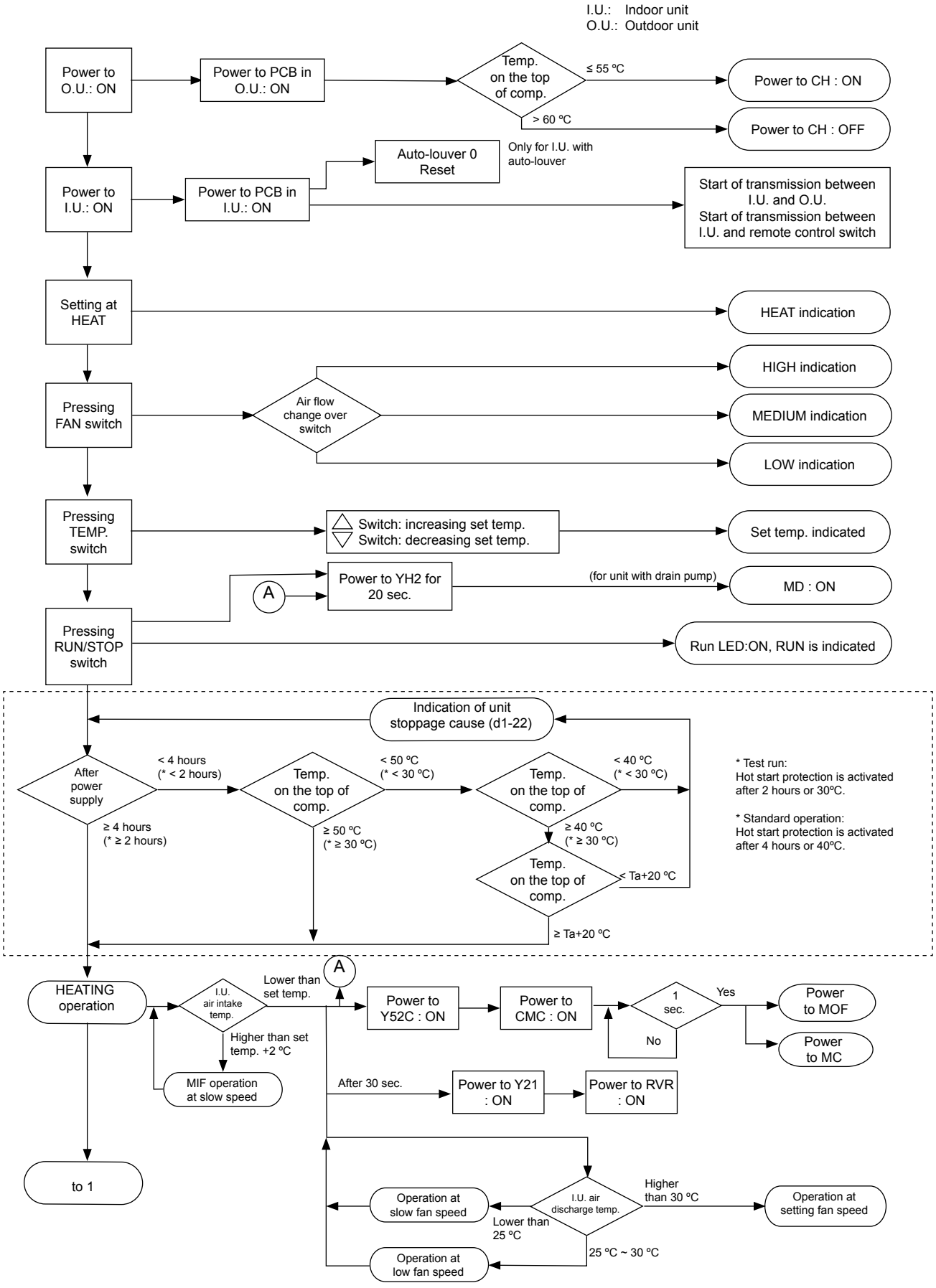

I.U.: Indoor unit
O.U.: Outdoor unit
from 1
Pressing AUTO-LOUVER switch
Alternatively
Start of AUTO-LOUVER
Stop of AUTO-LOUVER
only for air panel or indoor unit with auto-louver
Pressing RUN/STOP switch
Stop of inverter
Stop of MC
Temp. on the top of comp.
≤ 55 °C
> 60 °C
Power to CH : ON
Power to CH : OFF
Stop of MOF
Power to Y52C: OFF
Power to CMC: OFF
No
After 1 min. 20 sec.
Yes
Power to YH2: OFF
MD: OFF
(for unit with drain pump)
Power to EHW:OFF
(for unit with EHW)
Power to MIF: OFF
RUN/STOP lamp: OFF
DRY, set fan speed & set temp. indication: continuously ON
STOP
Power to I.U.: OFF
Power to PCB in I.U.: OFF
Indication LCD: OFF
Power to O.U.: OFF
Power to PCB in O.U.: OFF
Power to CH: OFF

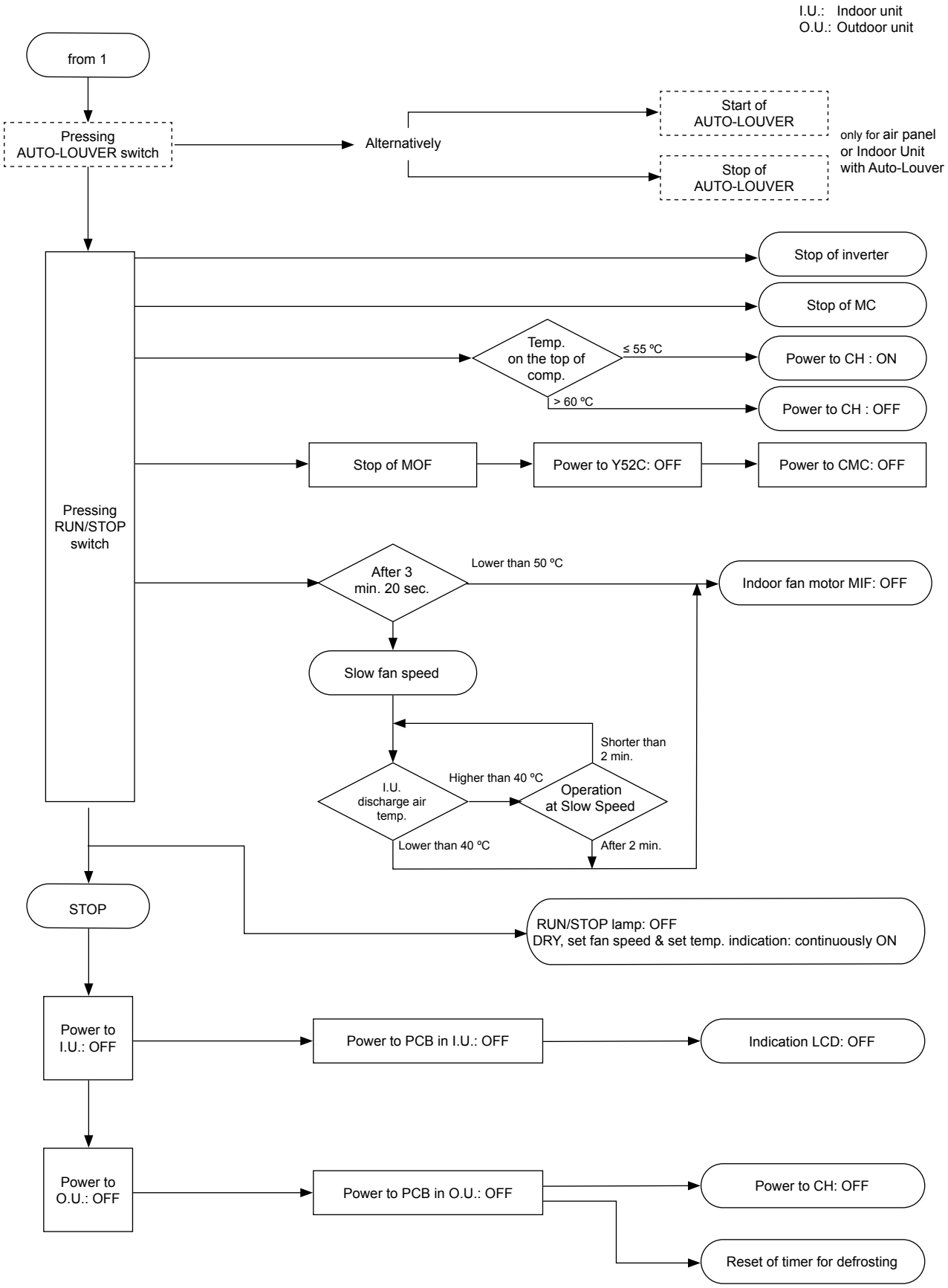
4.4.2. Dry operation


I.U.: Indoor unit
O.U.: Outdoor unit
Power to O.U.: ON
Temp. on the top of comp.
≤ 55 ºC
> 60 ºC
Power to CH : ON
Power to CH : OFF
Power to I.U.: ON
Power to PCB in I.U.: ON
Auto-louver 0 Reset
Start of transmission between I.U. and O.U.
Start of transmission between I.U. and remote control switch
FS
OFF (Higher than activation level)
ON (Lower than activation level)
Power to YH2 in I.U.: ON
Power to YH2 in I.U.: OFF
MD : ON
(for unit with drain pump)
Setting at DRY
DRY indication
Pressing TEMP. switch
Switch: increasing set temp.
Switch: decreasing set temp.
Set temp. indicated
Pressing RUN/STOP switch
Run LED:ON, RUN is indicated
Indication of unit stoppage cause (d1-22)
After power supply
< 4 hours (* < 2 hours)
≥ 4 hours (* ≥ 2 hours)
Temp. on the top of comp.
< 50 ºC (* < 30 ºC)
≥ 50 ºC (* ≥ 30 ºC)
Temp. on the top of comp.
< 40 ºC (* < 30 ºC)
≥ 40 ºC (* ≥ 30 ºC)
Temp. on the top of comp.
< Ta+20 ºC
≥ Ta+20 ºC
* Test Run:
Hot start protection is activated after 2 hours or 30ºC.
* Standard operation:
Hot start protection is activated after 4 hours or 40ºC.
Power to YH2 : ON
MD : ON
(for unit with drain pump)
Power to EHW : ON
I.U. Fan Operation: Low
DRY operation
I.U. Air intake temp.
Higher than Set Temp. +2 ºC
Outdoor Temp.
≥ -5 ºC
< -5 ºC
Power to Y52C : ON
1 sec.
Yes
No
Power to MC
Lower than set temp.
Power to MC: OFF
Power to MIF: OFF
Outdoor Fan MOF operation
6 min.
No
Yes
I.U. fan operation: low
No
6 min.
Yes
to 1

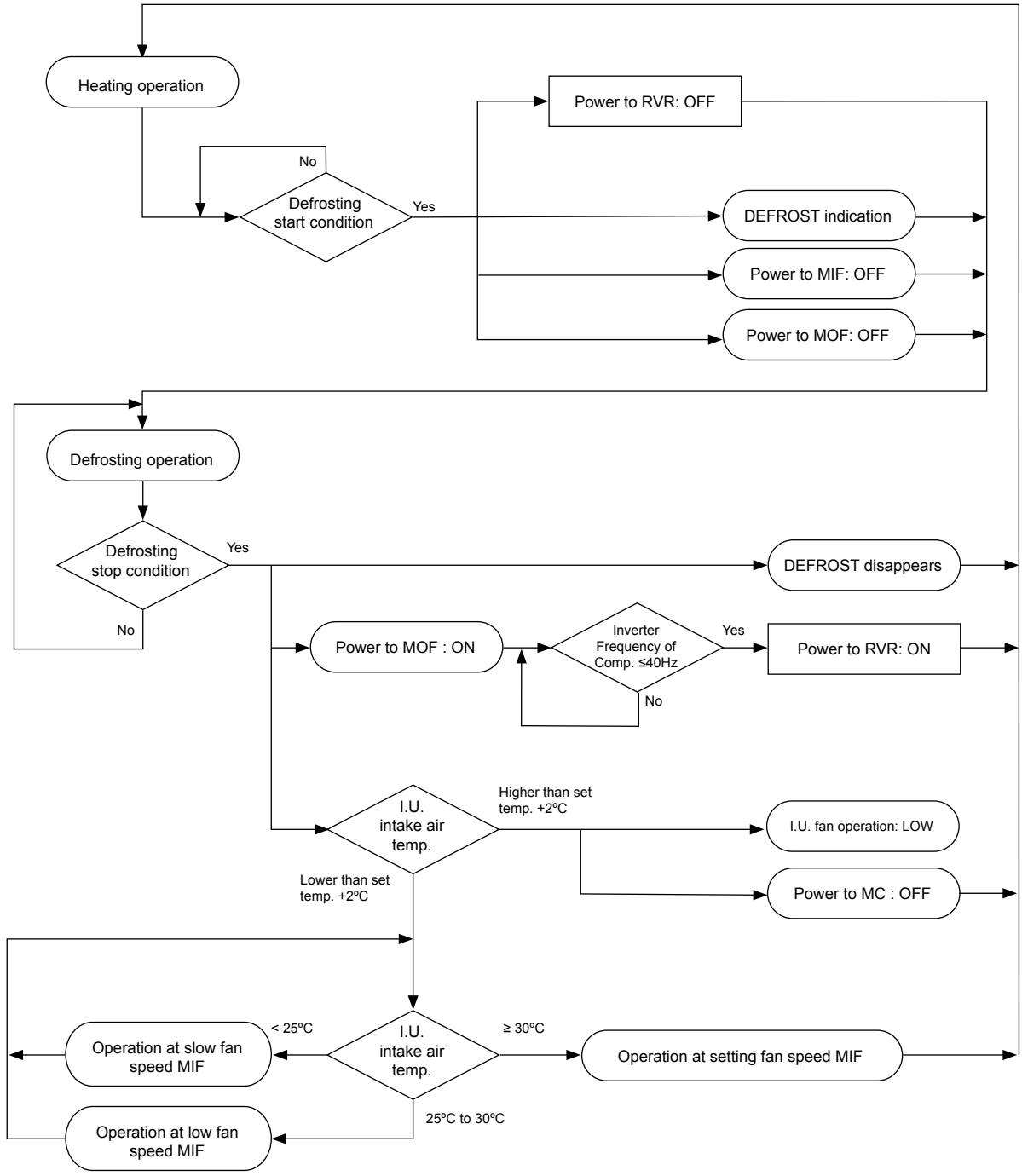

I.U.: Indoor unit
O.U.: Outdoor unit
from 1
Pressing AUTO-LOUVER switch
Alternatively
Start of AUTO-LOUVER
Stop of AUTO-LOUVER
only for air panel or indoor unit with auto-louver
Pressing RUN/STOP switch
Stop of inverter
Stop of MC
Temp. on the top of comp.
≤ 55 °C
> 60 °C
Power to CH : ON
Power to CH : OFF
Stop of MOF
Power to Y52C: OFF
Power to CMC: OFF
No
After 3 min. 20 sec.
Yes
Power to YH2: OFF
MD: OFF
(for unit with drain pump)
Power to EHW:OFF
(for unit with EHW)
Power to MIF: OFF
RUN/STOP lamp: OFF
DRY, set fan speed & set temp. indication: continuously ON
STOP
Power to I.U.: OFF
Power to PCB in I.U.: OFF
Indication LCD: OFF
Power to O.U.: OFF
Power to PCB in O.U.: OFF
Power to CH: OFF

4.4.3. Heating operation


I.U.: Indoor unit
O.U.: Outdoor unit
Power to O.U.: ON
Power to PCB in O.U.: ON
Temp. on the top of comp.
≤ 55 ºC
Power to CH : ON
> 60 ºC
Power to CH : OFF
Power to I.U.: ON
Power to PCB in I.U.: ON
Auto-louver 0 Reset
Only for I.U. with auto-louver
Start of transmission between I.U. and O.U.
Start of transmission between I.U. and remote control switch
Setting at HEAT
HEAT indication
Pressing FAN switch
Air flow change over switch
HIGH indication
MEDIUM indication
LOW indication
Pressing TEMP. switch
Switch: increasing set temp.
Switch: decreasing set temp.
Set temp. indicated
A
Power to YH2 for 20 sec.
(for unit with drain pump)
MD : ON
Pressing RUN/STOP switch
Run LED:ON, RUN is indicated
Indication of unit stoppage cause (d1-22)
After power supply
< 4 hours (* < 2 hours)
≥ 4 hours (* ≥ 2 hours)
Temp. on the top of comp.
< 50 ºC (* < 30 ºC)
≥ 50 ºC (* ≥ 30 ºC)
Temp. on the top of comp.
< 40 ºC (* < 30 ºC)
≥ 40 ºC (* ≥ 30 ºC)
Temp. on the top of comp.
< Ta+20 ºC
≥ Ta+20 ºC
* Test run:
Hot start protection is activated after 2 hours or 30ºC.
* Standard operation:
Hot start protection is activated after 4 hours or 40ºC.
HEATING operation
I.U. air intake temp.
Lower than set temp.
Higher than set temp. +2 ºC
MIF operation at slow speed
A
Power to Y52C : ON
Power to CMC : ON
1 sec.
Yes
No
Power to MOF
Power to MC
After 30 sec.
Power to Y21 : ON
Power to RVR : ON
to 1
I.U. air discharge temp.
Higher than 30 ºC
Operation at setting fan speed
Operation at slow fan speed
Lower than 25 ºC
25 ºC ~ 30 ºC
Operation at low fan speed

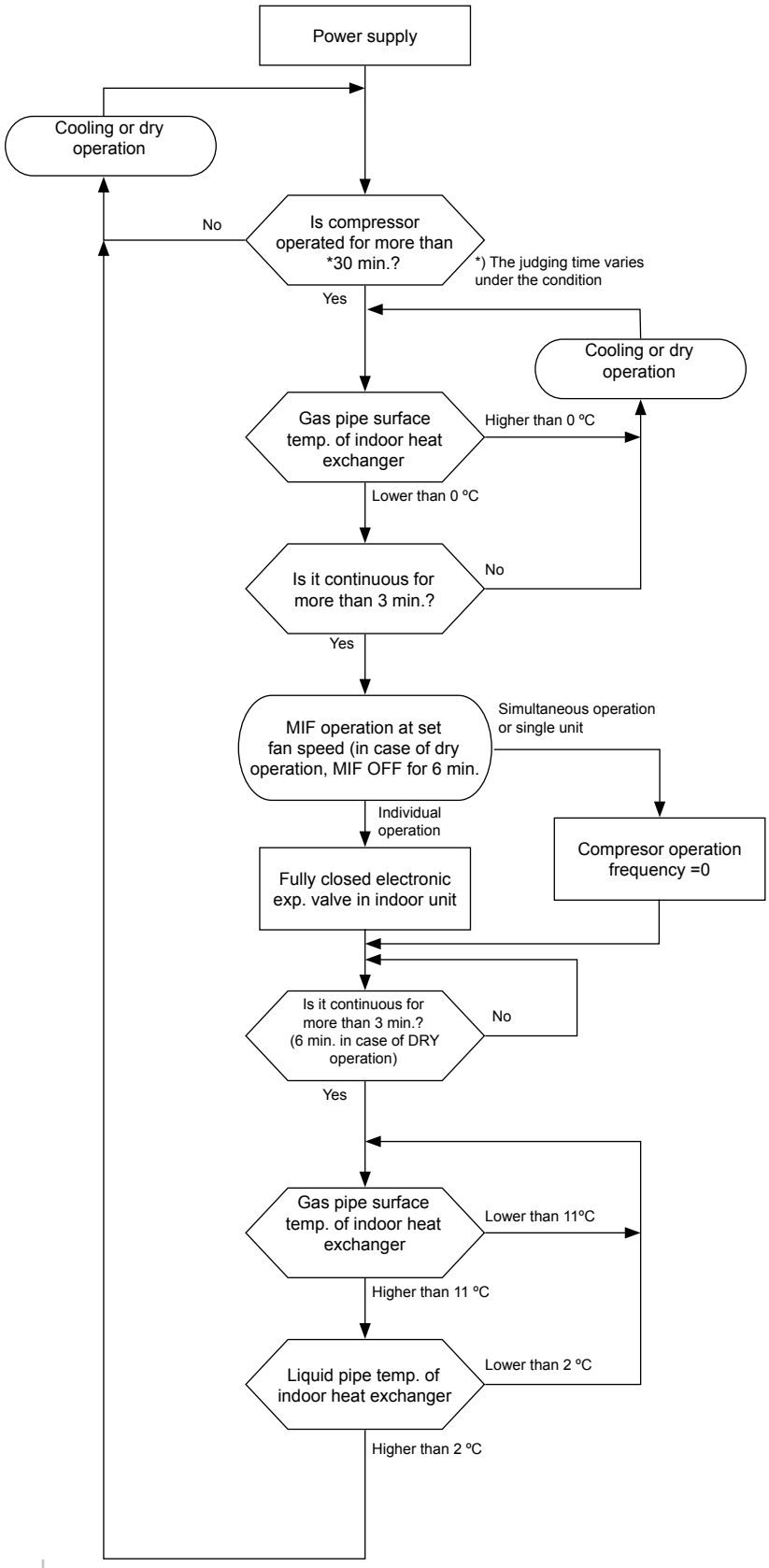

I.U.: Indoor unit
O.U.: Outdoor unit
from 1
Pressing AUTO-LOUVER switch
Alternatively
Start of AUTO-LOUVER
Stop of AUTO-LOUVER
only for air panel or Indoor Unit with Auto-Louver
Pressing RUN/STOP switch
Stop of inverter
Stop of MC
Temp. on the top of comp.
≤ 55 °C
> 60 °C
Power to CH : ON
Power to CH : OFF
Stop of MOF
Power to Y52C: OFF
Power to CMC: OFF
After 3 min. 20 sec.
Lower than 50 °C
Indoor fan motor MIF: OFF
Slow fan speed
Shorter than 2 min.
I.U. discharge air temp.
Higher than 40 °C
Operation at Slow Speed
Lower than 40 °C
After 2 min.
STOP
RUN/STOP lamp: OFF
DRY, set fan speed & set temp. indication: continuously ON
Power to I.U.: OFF
Power to PCB in I.U.: OFF
Indication LCD: OFF
Power to O.U.: OFF
Power to PCB in O.U.: OFF
Power to CH: OFF
Reset of timer for defrosting

4.4.4. Defrost operation control

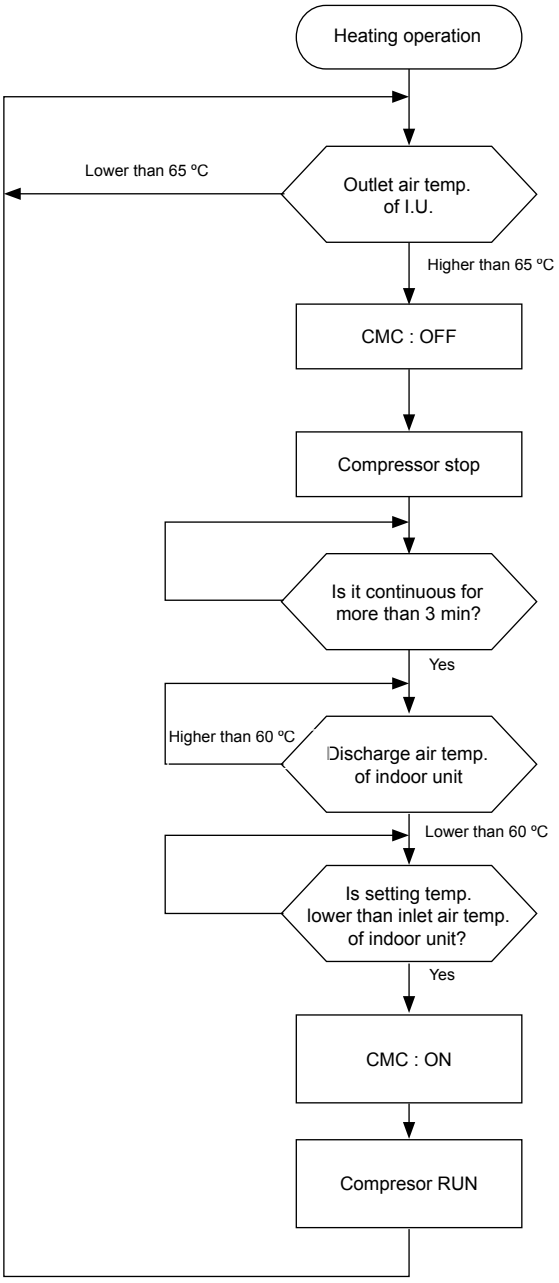


4.5. Standard control functions

4.5.1. Freezing protection during cooling process or dry operation


Power supply
Cooling or dry operation
No
Is compressor operated for more than *30 min.?
*) The judging time varies under the condition
Yes
Cooling or dry operation
Gas pipe surface temp. of indoor heat exchanger
Higher than 0 ºC
Lower than 0 ºC
Is it continuous for more than 3 min.?
No
Yes
MIF operation at set fan speed (in case of dry operation, MIF OFF for 6 min.
Simultaneous operation or single unit
Individual operation
Compresor operation frequency =0
Fully closed electronic exp. valve in indoor unit
Is it continuous for more than 3 min.? (6 min. in case of DRY operation)
No
Yes
Gas pipe surface temp. of indoor heat exchanger
Lower than 11ºC
Higher than 11 ºC
Liquid pipe temp. of indoor heat exchanger
Lower than 2 ºC
Higher than 2 ºC

4.5.2. Prevention control for excessively high discharge gas temperature

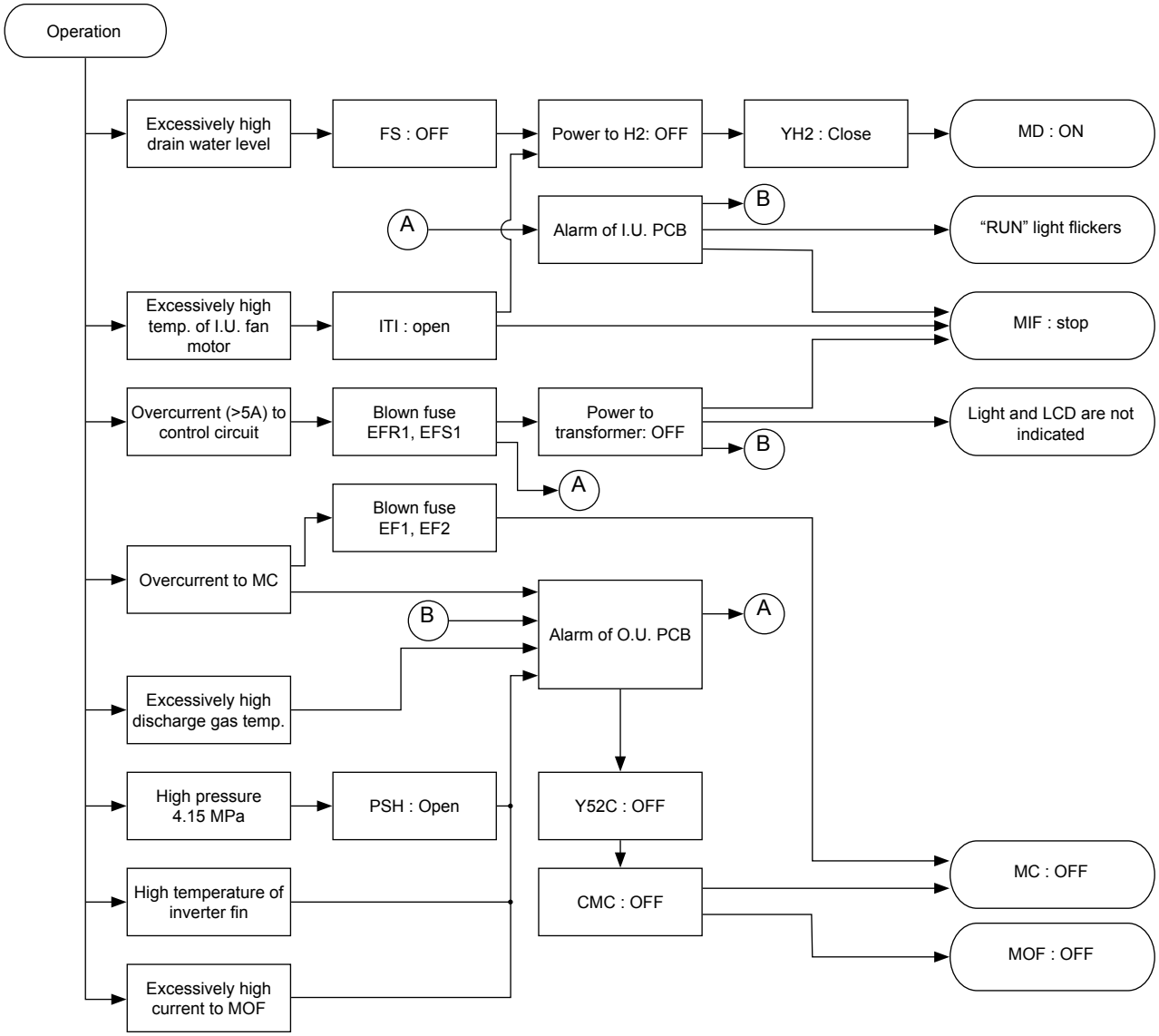

Heating operation
Outlet air temp. of I.U.
Lower than 65 ºC
Higher than 65 ºC
CMC : OFF
Compressor stop
Is it continuous for more than 3 min?
Yes
Higher than 60 ºC
Discharge air temp. of indoor unit
Lower than 60 ºC
Is setting temp. lower than inlet air temp. of indoor unit?
Yes
CMC : ON
Compresor RUN

4.5.3. Outdoor unit electrical expansion valve control

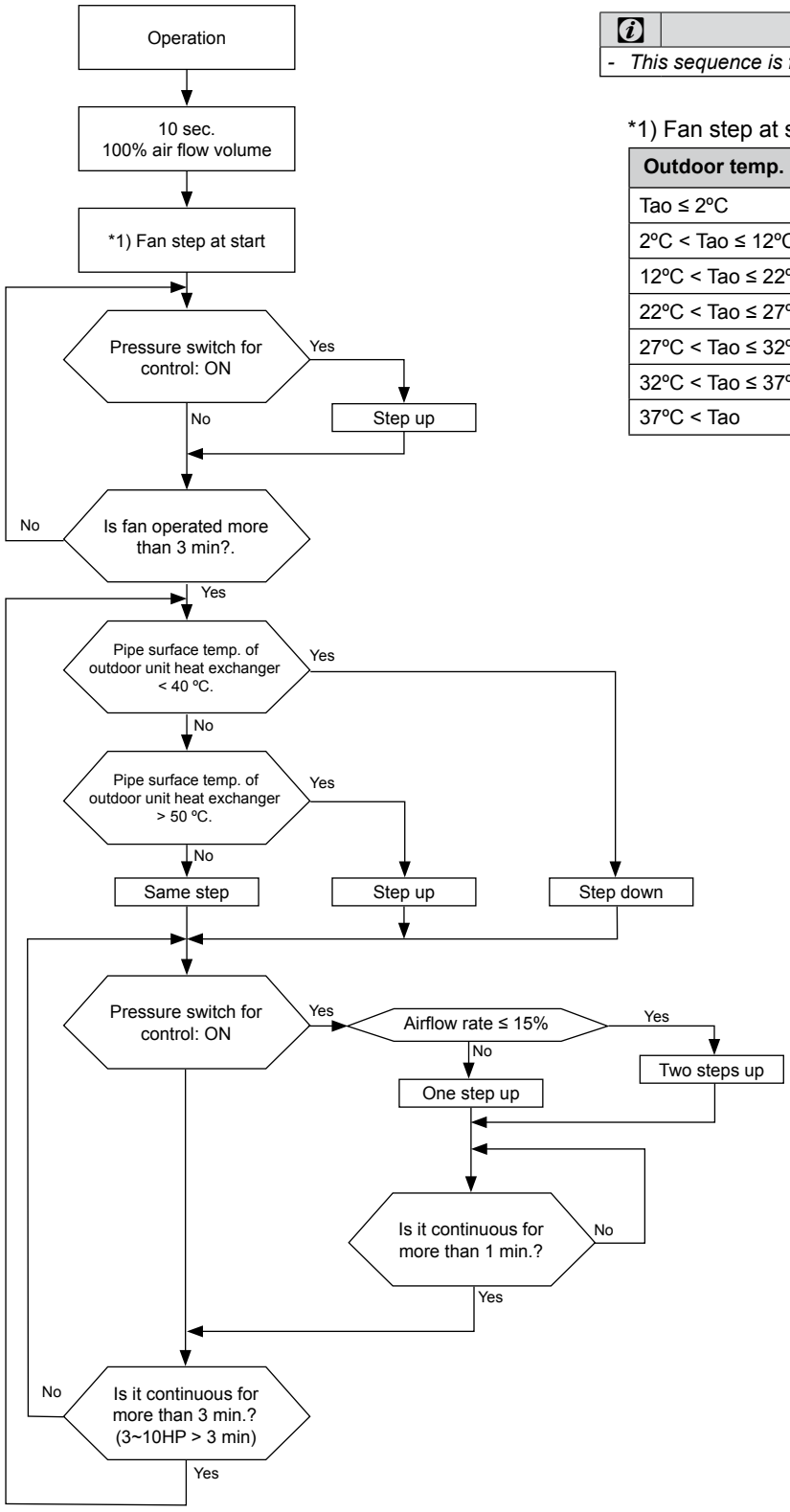
1. After supplying power source, the electronic expansion valve is completely opened.
2. When the compressor is stopped, the electronic expansion valve is completely closed to adjust its opening.
3. At starting operation (compressor is operated), opening of the electronic expansion valve is set at a specified opening.
   a) Specified opening during heating operation: 1 minute
4. During the cooling and the defrosting operations, the electronic expansion valve is set at the specified opening.
5. Normal opening of the electronic expansion valve.

Coling operation	Heating operation
• 480 pulse (100%)	1. Set of target temperature TdSH = 20~25 ºC 2. Simulation PI control for the electronic expansion valve. The electronic expansion valve opening is controlled so that the thermistor temperatures for the compressor can reach the target temperature.

4.5.4. Activation of protection device control



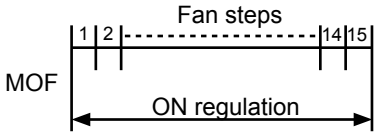
4.5.5. Outdoor Unit fan control during cooling operation



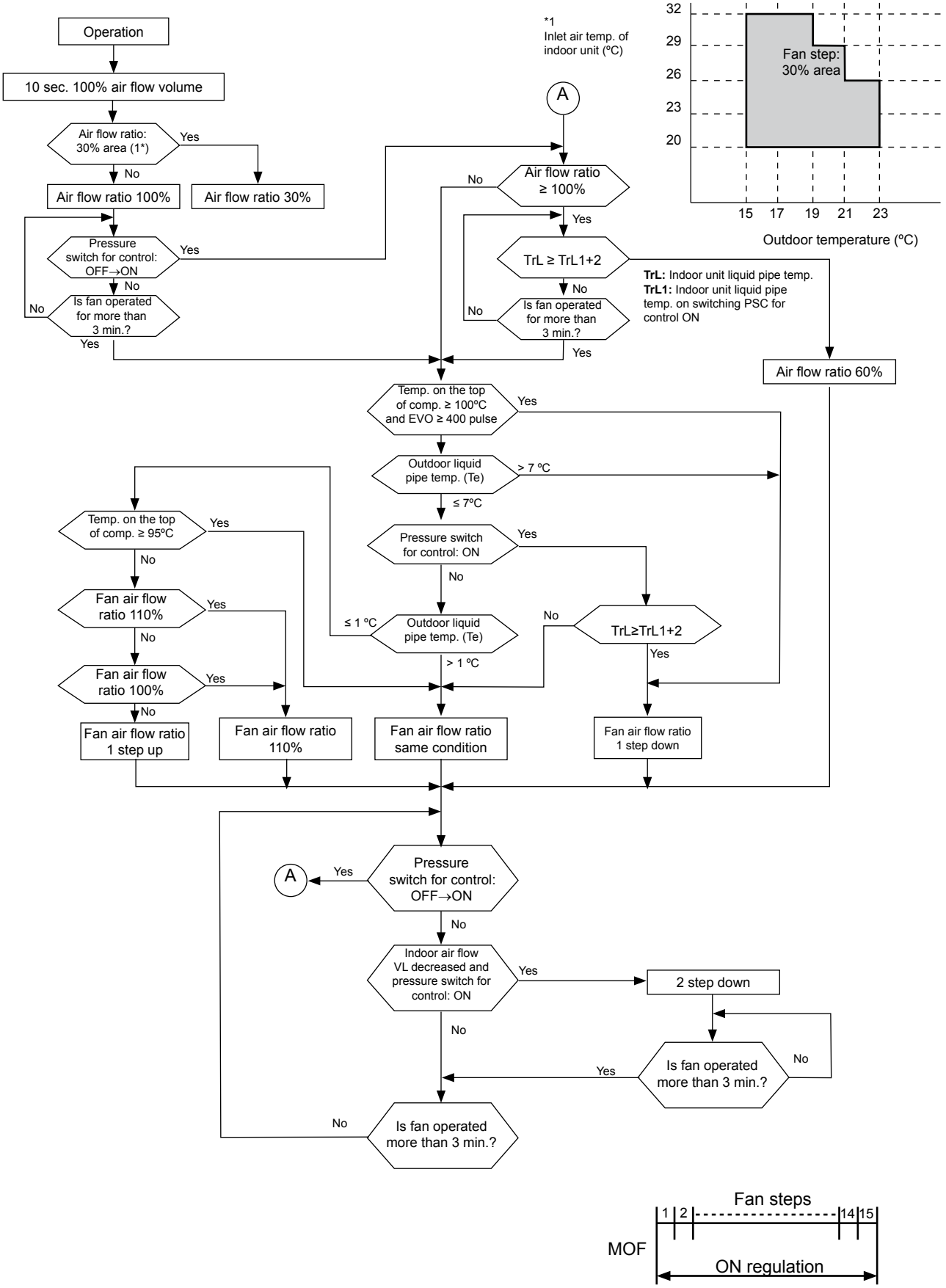
NOTE
- *This sequence is for the standard operation*

*1) Fan step at start

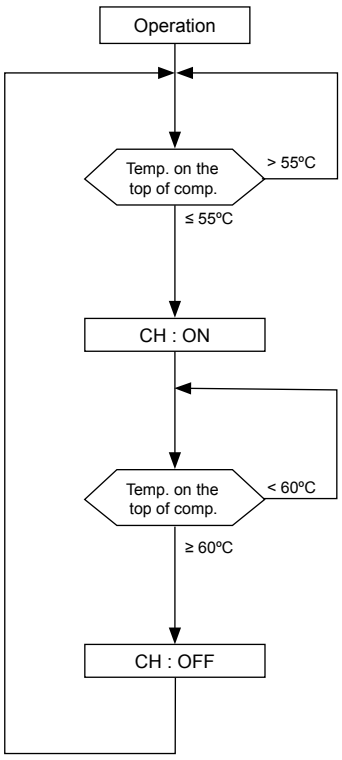
Outdoor temp. (Tao)	Air flow ratio
Tao ≤ 2ºC	15%
2ºC < Tao ≤ 12ºC	25%
12ºC < Tao ≤ 22ºC	40%
22ºC < Tao ≤ 27ºC	60%
27ºC < Tao ≤ 32ºC	80%
32ºC < Tao ≤ 37ºC	100%
37ºC < Tao	110%



4.5.6. Outdoor unit fan control during heating operation



4.5.7. Preheating control of compressor



4.5.8. Prevention control for high pressure increase

This function is performed to prevent the abnormal condition (Alarm: 02) when the outdoor air flow is decreased by a seasonal wind against air outlet.
When the **CMC** is ON during cooling operation, **PSC** is ON and (Te) is ≥ than Te1+4°C, forced thermo-off operation will be performed.

(Te): Outdoor liquid pipe temperature
Te1: i/o liquid pipe temperature when **PSC** is ON
PSC ON: 3.60 MPa

However, if it occurs more than 6 times during operation, forced thermo-off operation will not be performed.
Cause of stoppage will be 13(d1-13).

5. Available Optional Functions

Contents

5. Available optional functions 83

5.1. RASC-(3~10)H(V)RNE Units 84

5.1.1. Available ports 84
5.1.2. Configuration 86
5.1.3. Description of optional input signals 88
5.1.4. Description of optional output signals 89
5.1.5. Optional functions 89
5.1.6. Outdoor units available optional functions 94

5.2. Available optional functions through the remote control switch (PC-ART) 95

5.2.1. Optional function setting 95
5.2.2. Optional functions of the remote control switch 99

5.3. Available optional functions through the remote control switch (PC-ARH) 108

5.3.1. Alarm indication 109

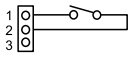
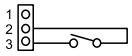
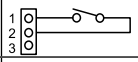
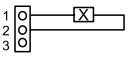
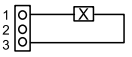
5.4. Available optional functions through wireless remote control switch (PC-LH3A + receiver) 110

5.1. RASC-(3~10)H(V)RNE Units

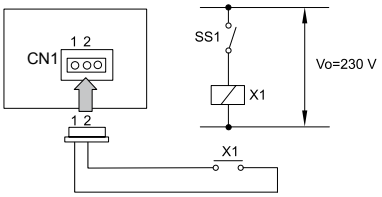
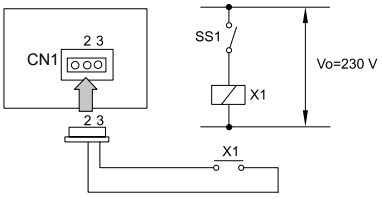
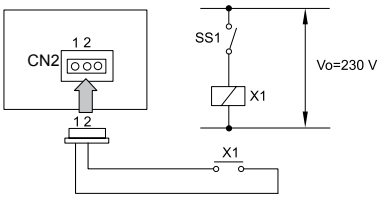
The system has eight input and five output signals that are programmed in the PCB of the outdoor unit using connectors CN1 and CN2 for the input signals and CN7 for the output signal.
Connectors CN1 and CN2 have two and one ports respectively to configure three input options out of the eight options the system has.
Input connector CN1 has two ports to configure two input options out of the five options the system has.
The system has ten optional functions that are programmed in the PCB of the outdoor unit.

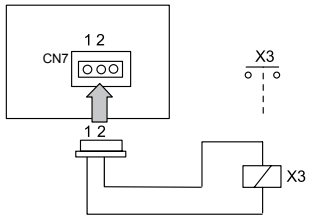
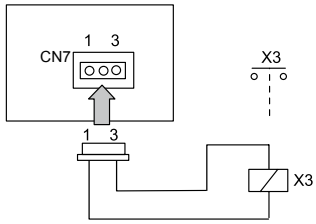
5.1.1. Available ports

The system has the following input and output ports.

Content		Setting of the port in the PCB of the indoor unit	Remarks	Outlet
Inputs	i1	1-2 of CN1		Contact
	i2	2-3 of CN1		Contact
	i3	1-2 of CN2		Contact
Outputs	o1	1-2 of CN7		DC 12V
	o2	1-3 of CN7		DC 12V

Connection:
The system has the following connections.

Input connections	
Indication	**Connections**
i1	
i2	
i3	

Output connections	
Indication	**Connections**
o1	
o2	

Specification of the components for a correct installation

Component		Manufacturer or specifications	Remarks
Auxiliary relay (X3)		OMRON mini power relay model: MY1F or equivalent	Voltage between relay terminals 12 Vdc - 75 mA
(SS1) (x1), (x2) contact example		Manual type	Voltage between terminals of the 230V - 5 mA contactor
3P connector cable		Optional part PCC-1A (capable of connecting the JST XHP –3 connector)	Five wires with connectors as one set
Wire (control	Voltage: 12V DC.	0.5 mm²	
Wire (power)	Voltage 230V	2.0 mm²	

NOTE

- *The connection of the input signal is only an example.*
- *Keep the CN1 and CN2 wires as short as possible.*
- *Do not run the wires along 230 V/400 V CA power cables separately install them at a distance of more than 30cm. (The cables may intersect.)*
- *If you install the wires along a power supply wire, insert the wires in a metal conduit tube and ground one end of the tube.*
- *The maximum wiring length is 70 m. If you use this function, it is recommended that you use safety devices such as an electrical leakage breaker or a smoke detector.*

5.1.2. Configuration

Available optional signals
H(V)RNE units have the following signals that are described in the following table.
These signals are set up through the PCB of the outdoor unit.

- **Input signals**

Ind.	Input signal	Application	Port
00	Nº setting application	Nº setting	
01	Fixing the heating mode	This signal allows to pre-fix the operation mode, in this case the heating mode, independently of what the indoor unit requests. If the indoor units request the oposite mode than the outdoor unit, the compressor will not start. This is very useful to set up a unique operation mode.	CN1 and CN2
02	Fixing the cooling mode	This signal allows to pre-fix the operation mode, in this case the cooling mode, independentlyof what the indoor unit requests. If the indoor units request the oposite mode than the outdoor unit, the compressor will not start. This is very useful for computer rooms where the cooling mode is fixed throughout the year.	CN1 and CN2
03	Demand thermo OFF	This signal allows to stop the compressor if it reaches a certain power as well as to put the indoor unit in Thermo-OFF. This is very useful for installations with high power consumption.	CN1 and CN2
04	Forced stoppage	This signal allows to control the stoppage of the compressor and the fans of the indoor as well as outdoor units. This is very useful when used with the alarm signals of the fire prevention systems.	CN1 and CN2
05	Current control demand 50%	This signal allows to regulate current consumption and establish an average consumption of 50% of the rate point. This is very useful for installations that run 24 hours a day.	CN1 and CN2
06	Current control demand 75%	This signal allows to regulate current consumption and establish an average consumption of 75% of the rate point.This is very useful for installations that run 24 hours a day.	CN1 and CN2
07	Current control demand 100%	This signal allows to regulate current consumption and establish an average consumption of 100% of the rate point. This is very useful for installations that run 24 hours a day.	CN1 and CN2

- **Output signals**

Ind.	Output signal	Application	Port
00	Nº setting application	Nº setting	
01	Operation signal	This signal allows to pick up the machine's operation signal. This is very useful to start up additional systems such as humidifiers, fans and other additional air-conditioning systems.	CN7
02	Alarm signal	This signal picks up the machine's alarm. This is very useful to warn that an alarm has been tripped.	CN7
03	Compressor ON signal	This single allows to pick up the compressor's operation signal. It is very useful for checking signals during remote-control operation and for the interlock of the outdoor unit.	CN7
04	Defrost operation signal	This signal allows to pick up the defrosting of the unit. This is very useful to know how the indoor unit is operating if there is an abnormal situation.	CN7

NOTE

- *Do not set same function (01~04) to multiple input port.*

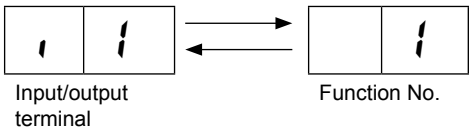
Programming
The optional signals are programmed through the PCB of the outdoor unit.

Setting of the optional signals
The optional signals of the outdoor unit are set up from the PCB of the outdoor unit and push switches PSW1, PSW2 and PSW3

- **Selection of the input signal**

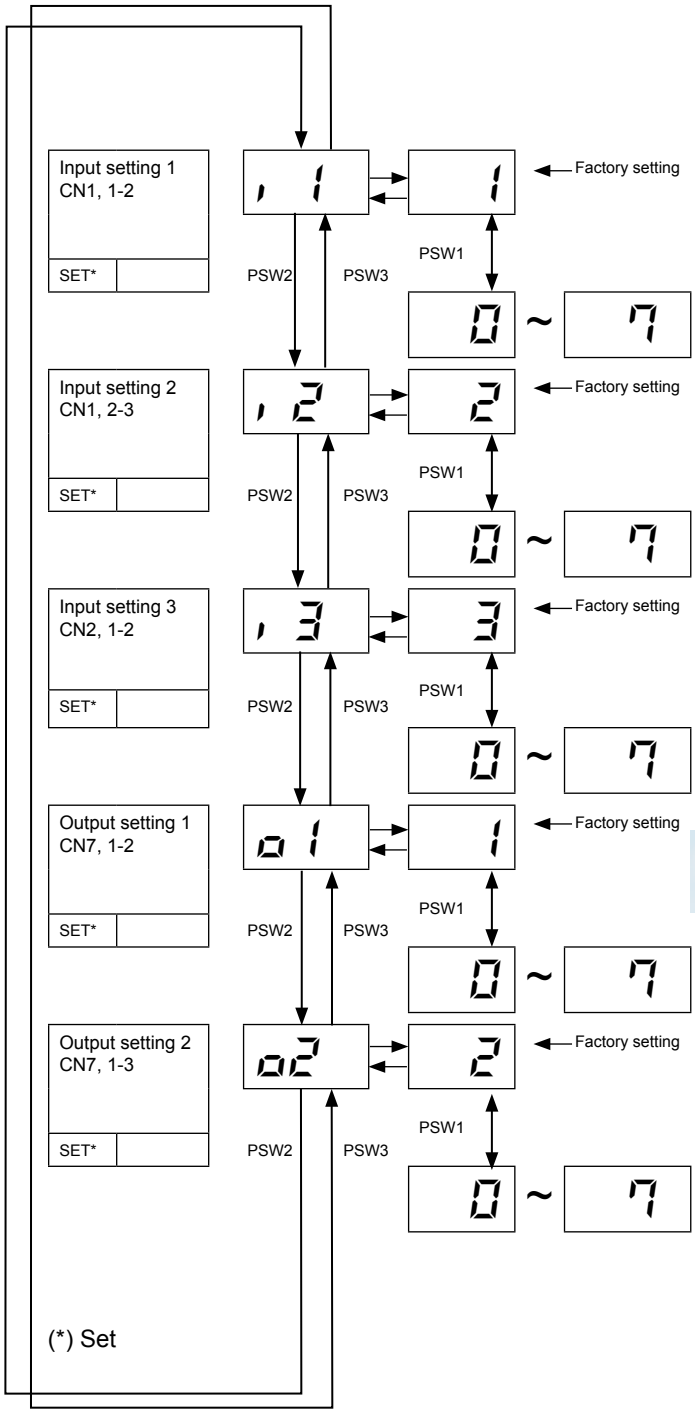
  If the below setting change is required on-site, perform the following instructions:

  1. While the outdoor unit is ON, set the following DIP switches on the printed circuit board of the outdoor unit as follows: set pin 6 of DSW2 to ON. Because of these settings, the function selection mode becomes available and the following indication appears on the 7-segment display.



  This indicates that function No.1 (set heating mode) is set at input 1.

  2. By pressing the push switches PSW1, PSW2 and PSW3, you change the input/output terminal name. The flowchart shown on the side reflects the changes on the 7-segment display when you press PSW2 and PSW3.
  3. After selecting the input/output terminal name, select your required function by pushing the PSW1.
  4. After setting the pin 6 of DSW2 to OFF, the selected contents are memorized in the PCB of the outdoor unit, and, immediately afterwards, the function selection mode is set to OFF. The memorized data is maintained even when the power supply wires are disconnected. The connection details of each function, as well as the required parts, are described in the first section.



5.1.3. Description of optional input signals.

- **Fixing operation mode (heating / cooling) (1 / 2)**

  This input function is fixed in terminals CN1 or CN2 of the PCB of the outdoor unit, to use it as a cooling and heating mode. CN1 must be set up as follows.

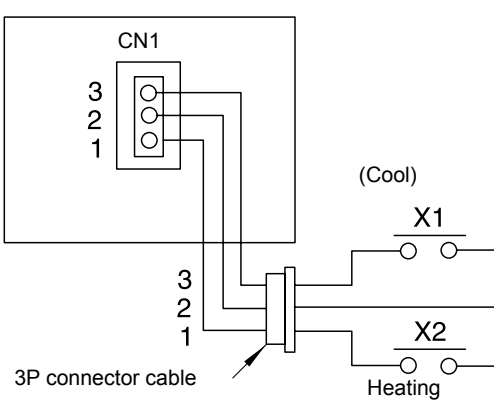
  Short circuit between the terminals 1 and 2 of CN1: set heating mode.

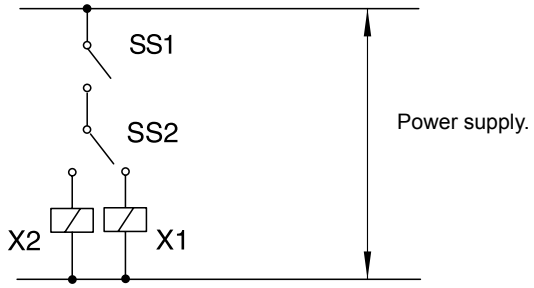
  Short circuit between the terminals 2 and 3 of CN1: set cooling mode.

  After having pre-fixed the established mode, the remote control can only be used to adjust the temperatures. Stoppage code “d1” “20”will be displayed if an attempt is made to change the operation mode of any of the indoor units with the remote control.

Example of wiring diagram of fixing the operation mode.

Outdoor unit PCB:





SS1:Fixing operation mode switch
SS2:Changeover switch
X2:Cooling
X1:Heating

- **Demand thermo OFF (3)**

  This is an input function to control the maximum power that the compressor can consume. When this option is turned on, the outdoor units are stopped completely, and the indoor units go into THERMO-OFF. Alarm “10” is displayed on the remote control. If the switch of this function is disconnected it becomes available again.

  Connect the cabling and use the materials as shown in section “Avaliable ports”

- **Forced stoppage (4)**

  This is an input function that turns on when the switch receives a signal that causes the compressor and the fan motor of the indoor unit to stop; alarm “10” displays on a remote-controlled when this option turns on. If the switch of this function is disconnected it becomes available again.

  Connect the cabling and use the materials as shown in section “Avaliable ports”

- **Current control demand (5/6/7)**

  This is an input function that turns on when it detects that the frequency of the compressor reaches 50%, 75% or 100%. The frequency of the compressor is determined when the maximum current reaches the established limit.

  Connect the cabling and use the materials as shown in section “Avaliable ports”

  If the running current of the outdoor unit exceeds the maximum limit, the unit changes to the thermo-OFF condition. Stoppage cause code “10” will appear. When the input terminal is opened during the demand current control, the control of the input terminal is reset.

5.1.4. Description of optional output signals

- **Operation signal (01)**

  This optional signal is used to pick up the operation signal. It can be used to turn on or off complementary units of the air-conditioning system,such as fans, humidifiers, etc.

  Connect the cabling and use the materials as shown in section “Avaliable ports”.

  Note that the contact of auxiliary relay X3 is closed when an operation signal is issued.

- **Alarm signal (02)**

  This optional signal is used to pick up the activation of safety devices.

  Connect the cabling and use the materials as shown in section “Avaliable ports”.

  Note that the contact of auxiliary relay X3 is closed when an operation signal is issued.

- **Compressor on signal (03)**

  This optional signal is used to pick up the signal when the compressor is ON. It can be used to check how the compressor is running at all times. It is very useful for locking the compressor when the fans are locked.

  Connect the cabling and use the materials as shown in section “Avaliable ports”

  Note that the contact of auxiliary relay X3 is closed when an operation signal is issued.

- **Defrost operation signal (04)**

  This optional signal is used to pick up when defrosting turns on. It is very useful to check if the indoor unit is in thermo-OFF.

  Connect the cabling and use the materials as shown in section “Avaliable ports”.

  Note that the contact of auxiliary relay X3 is closed when an operation signal is issued.

5.1.5. Optional functions

Programming

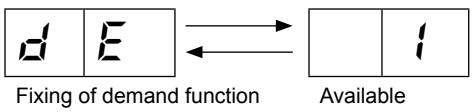
The optional signals are programmed through the PCB of the outdoor unit.

Setting of the optional signals

The optional signals of the outdoor unit are set up from the PCB of the outdoor unit and push switches PSW1, PSW2 and PSW3

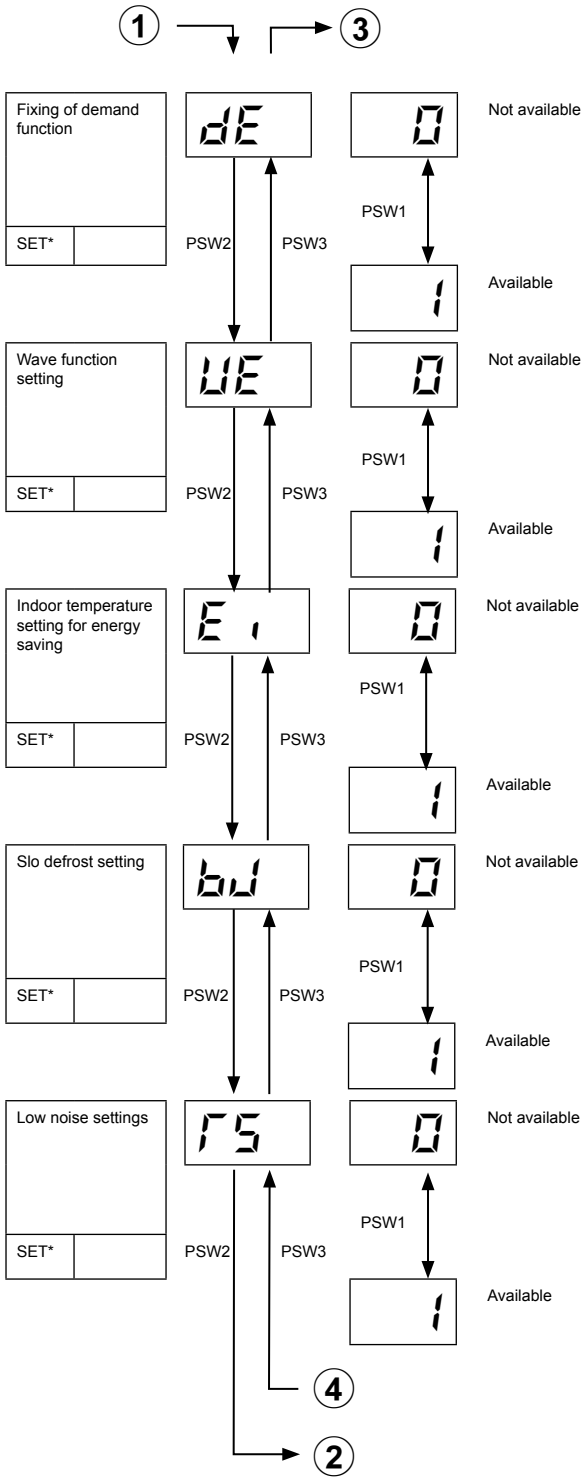
- **Selecting the optional function**

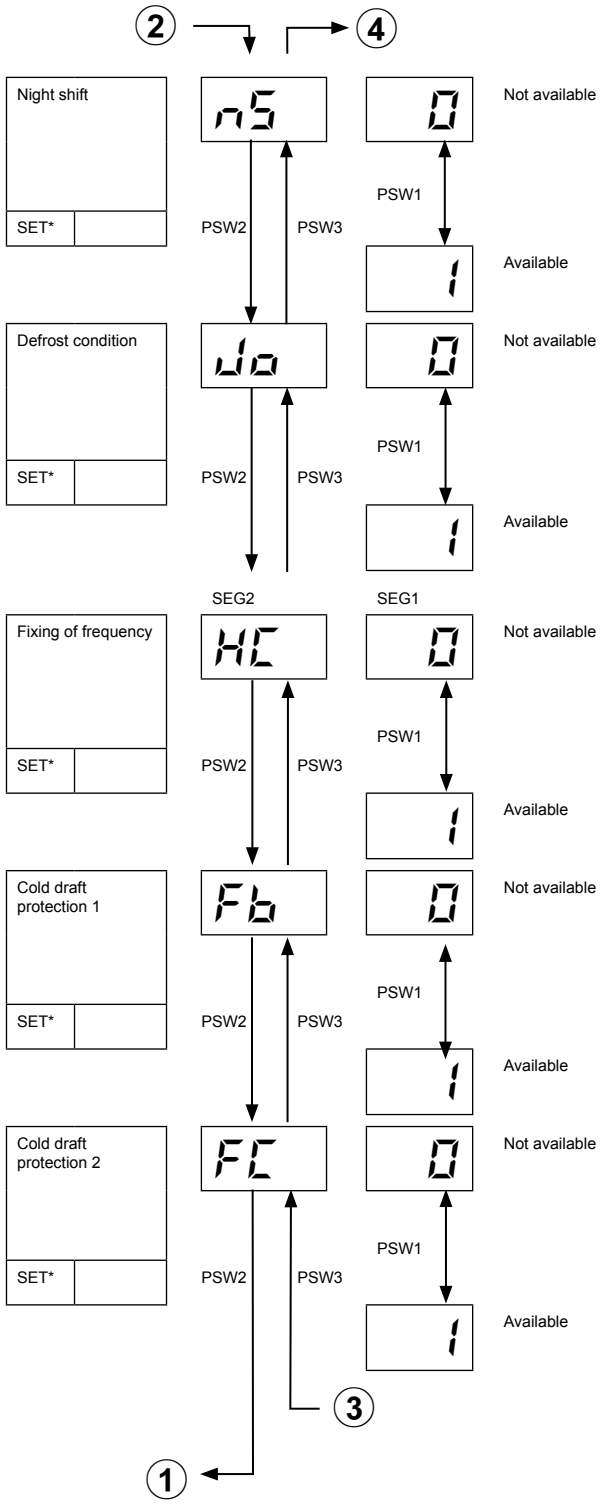
1. While the outdoor unit is ON, set the following DIP switches on the printed circuit board of the indoor unit as follows: set pin 5 of DSW2 to ON. Because of these settings, the function selection mode becomes available and the following indication appears on the 7-segment display.



   This indicates that the “fixing of demand” function is available.

2. By pressing push switches PSW2 and PSW3, you change the input/output terminal name. The flowcharts shown on the next page reflects the changes on the 7-segment display when you press PSW2 and PSW3.
   (See the flowcharts on the next page)
3. After selecting the terminal of the function setting, select the availability function by pressing the PSW1.
4. After setting the pin 5 of DSW2 to OFF, the selected contents are memorized in the PCB of the outdoor unit, and, immediately afterwards, the function selection mode is set to OFF. The memorized data is maintained even when the power supply wires are disconnected.


1
3
Fixing of demand function
SET*
dE
0
Not available
PSW1
PSW2
PSW3
1
Available
Wave function setting
SET*
UE
0
Not available
PSW1
PSW2
PSW3
1
Available
Indoor temperature setting for energy saving
SET*
E1
0
Not available
PSW1
PSW2
PSW3
1
Available
Slo defrost setting
SET*
bU
0
Not available
PSW1
PSW2
PSW3
1
Available
Low noise settings
SET*
rS
0
Not available
PSW1
PSW2
PSW3
1
Available
4
2


2
4
Night shift
SET*
nS
0
Not available
PSW1
PSW2
PSW3
1
Available
Defrost condition
SET*
dO
0
Not available
PSW1
PSW2
PSW3
1
Available
SEG2
SEG1
Fixing of frequency
SET*
HC
0
Not available
PSW1
PSW2
PSW3
1
Available
Cold draft protection 1
SET*
Fb
0
Not available
PSW1
PSW2
PSW3
1
Available
Cold draft protection 2
SET*
FC
0
Not available
PSW1
PSW2
PSW3
1
Available
3
1

- **Fixing of demand function**

  This function regulates the running current of the outdoor unit. If the demanded current is above the set current, the indoor unit capacity is reduced. The running current can be regulated both from internal signal. The capacity regulation is 50%, 75%, 100%.

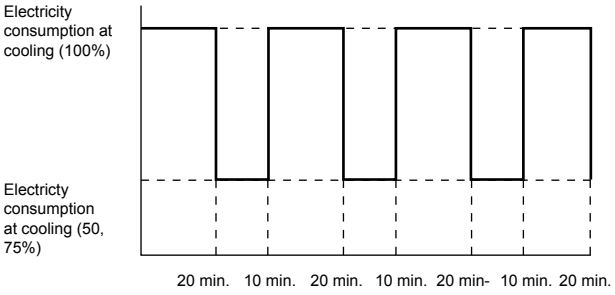
  This function can be activated when the demand is selected at one of input terminal indications ｣1, ｣2 and ｣3

  In case that multiple demand functions are set the input terminal indications, ｣1, ｣2 and ｣3,

  The demand running current is selected with 5, 6, 7 . PSW1.

- **Wave function setting**

  This function regulates the power consumption of the outdoor unit. While this function is activated, the maximum limit of running is changed as shown bellow:



  This function can be activated when the demand is selected at one of input terminal indications ｣1, ｣2 and ｣3.

  The minimum limit of running current control is according to the set value of the demand function.

  If the demand function is not set at the input terminal indication, this function can not be activated.

- **Indoor temperature setting for energy saving**

  This function can be activated when the customer wants to reduce the system power consumption. The setting temperature will be increased or decreased depends if it is in cooling or heating mode.

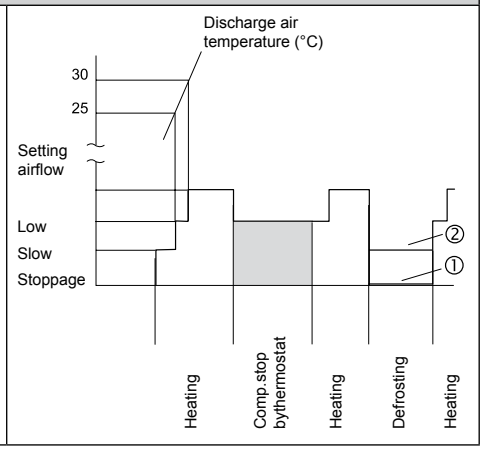
- **Setting defrosting at low-speed**

  Using this option, you can select the speed of the indoor unit fan during the defrost period.

Fan speed during defrosting

① Standard situation: Indoor unit fan stoppage during defrosting.

② Optional situation: Speed of the indoor unit fan at slow mode during the defrosting.



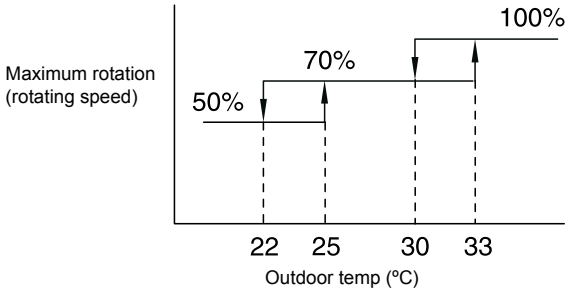
- **Low noise setting**

  This function can be activated and then the compressor frequency is set lower than the normal setting. This function can activate in cooling or heating mode.

- **Night-shift (low noise)**

  When you set the operation mode to night mode (low noise), which is used especially during the nighttime, the cooling capacity is decreased to 60%. You should use the night shift operation only when the remaining cooling capacity can supply the requested temperature.

- **Outdoor fan**

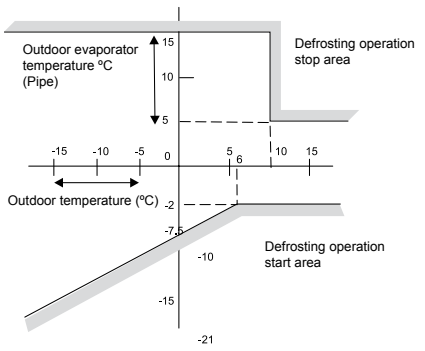


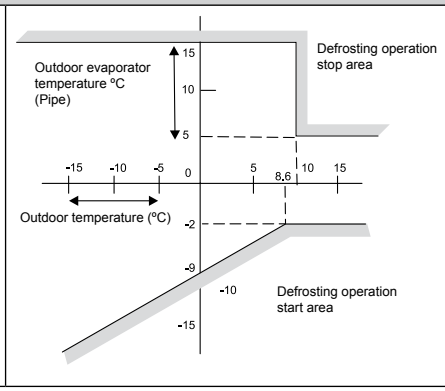
	NOTE
-	*The maximum rotation (rotating speed) is always 100% for the standard unit. (No limitation of the outdoor temperature).*

- **Change of defrost operation conditions**

This function allows to change the operation conditions in defrosting mode.

The change is shown in the following illustrations:

Normal defrosting condition	
Temperature conditions under defrost operation. When change of defrost condition is NOT set.	

Optional defrosting condition	
Temperature conditions under defrost operation. When change of defrost condition is set	

- **Fixing of frequency**

  No setting for this function is available.

- **Cool draft protection 1**

  This function can be activated, when the minimum discharge Air temperature falls down to 8 ºC in cooling operation. Outdoor fan stop and compressor frequency forcibly declines to prevent discharge air temperature from dropping.

- **Cool draft protection 2**

  This function can be activated, when the minimum discharge Air temperature falls down to 10ºC in cooling operation. Compressor stop. In this case stoppage code Nº 24 is given.

- **Optional functions (jumper)**

  – **Fixing cooling mode**
  When this function is activated, the operation mode is fixed in cooling mode. Thermo ON is only available for COOL or DRY mode at indoor unit. The minimum temperature is -5 ºC.
  To activate this option the jumper JP4 of the outdoor unit PCB1 must be cut.

  – **Alternative defrost mode**
  When one outdoor unit is connected with one H-LINK system with other outdoor units, is under defrosting, the other outdoor units defrosting is cancelled.
  After one outdoor unit defrosting is completed, another outdoor unit starts defrosting operation.
  To activate this option the jumper JP5 of the outdoor unit PCB1 must be cut.

  – **R407C piping**
  If you are using conventional R410A refrigerant instead of R407C refrigerant pressure will be increased. To avoid pressure increase will activate this function.
  To activate this option the jumper JP6 of the outdoor unit PCB1 must be cut.

5.1.6. Outdoor units available optional functions

Optional functions	
Optional function	**Explanation**
Fixing the energy saving request function.	This function regulates the outdoor unit consumption to 50%, 70% or 100%. If the required power is above the set value, the capacity of the indoor unit will be reduced proportionally to the power consumption of the outdoor unit. It can even come to a thermostatic stop if necessary. This function can be configured using an external or internal signal, depending on the needs of the installation. Configuration by external signal is very useful for setting up groups of outdoor units. The internal signal is useful for setting up a single outdoor unit.
Thermostatic stoppage order	When this function is activated the compressor is stopped and the indoor units are on thermo OFF.
Low speed defrost adjustment.	When this function is activated the indoor fan speed at defrost mode changes to slow instead of stopping the fan.
Low noise setting	This function decreases the sound levels of the outdoor units by reducing the maximum working frequency of the compressor (Cooling/Heating).
Night mode (low noise) operation	This function reduces the sound level of the outdoor units by decreasing the maximum working frequency of the compressor and the fan airflow according to the outside temperature (only for cooling mode).
Change of defrost operation conditions	This function changes the defrosting operation conditions. It is especially useful in cold areas.
Protection against cold air discharge (1)	When the air discharge temperature of the indoor unit is less than or equal to 10 ºC in cooling mode, the fans stop and the frequency of the outdoor unit is reduced, thereby preventing any discomfort to the occupants of the room.
Protection against cold air discharge (2)	When the discharge temperature of the air in the indoor unit is less than or equal to 10 ºC in cooling mode, the compressor stops and alarm no. 24 appears.
Wave function setting	This function controls the outdoor unit consumption in the following way: It allows a consumption of 100% for 20 minutes. The following 10 minutes it goes down to 70% and then alternates between 100% and 70%.
Indoor unit energy-saving temperature setting	This function reduces the power consumption of the indoor unit according to the temperature.
Piping for the R407C	If you use conventional R407C piping instead of the R410A, the piping pressure will increase. This function is activated in order to avoid this pressure increase.
Alternation in defrost mode activation	This function is useful in an installation consisting of various outdoor units placed in the same H-LINK. The defrost mode is activated alternately in each outdoor unit.
Fixing the cooling mode	This function sets the cooling mode: the indoor unit will only start when the system is on COOL or DRY.
Fixing the heating mode	This function sets the heating mode: the indoor unit will only start when the system is on HEAT or DRY/FAN.
Signal capture	This function provides information on the units operation, (operation, alarm, compressor ON, defrosting signals) so the necessary devices can be activated.

5.2. Available optional functions through the remote control switch (PC-ART)

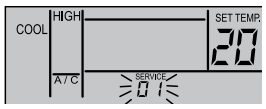
5.2.1. Optional function setting

The remote control switch is changed to the optional setting mode by the following procedures.

Programming with the PC-ART

The optional signals are programmed using the remote control switch.

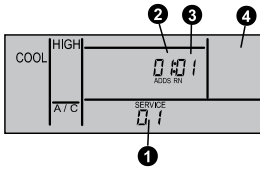
- **Programming and setting mode**
  Make sure the unit is stopped. Press the "↵ OK" and the "RESET" switches on the remote control switch simultaneously more than 3 seconds, and the remote control switch is changed to the field setting mode.
  The "SERVICE" indication is displayed, and "01" flickers below it.



- **Selecting SERVICE 01**
  When in the programming and setting mode, press the "TEMP ⌃" or the "TEMP ⌄" switch, and the number that flickers below the "SERVICE" indication will change (01 → 02). Set the flickering number to "01", maintain it during 7 seconds or press the "↵ OK" switch, and the remote control switch will change to optional setting mode.

- **Selection of indoor unit**

a. In SERVICE 01 selection mode, the indication of the remote control switch will change as shown in the figure below.



❶ The "01" indication is activated.
❷ The address of the indoor unit for which the optional function is to be set is indicated in the segments for timer setting time indication and "ADDS" is indicated below.
❸ The refrigerant cycle number of the outdoor unit for which the optional function is to be set is indicated in the segments for timer setting time indication and "RN" is indicated below.
❹ The indication of the setting temperature is turned OFF.

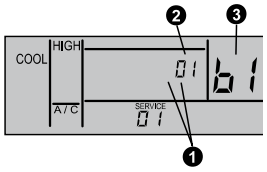
b. In previous point (a), press the "TEMP " switch ⌃ or the "TEMP " switch ⌄ of the remote control switch and the indoor unit for which the optional function is to be set, can be changed.

	NOTE
	- The indoor unit can be selected among the indoor units connected to the remote control switch. *- If both the indication of the address and the refrigerant cycle number is "AA", the settings of all the indoor units are the same.*

c. After selecting the indoor unit, leave the condition for 7 seconds or press the "OK" switch, the remote control switch is changed to the optional setting mode.

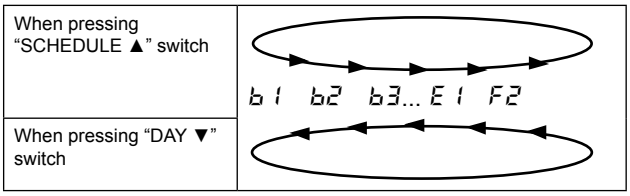
- **Changing the optional signals and setting conditions**

a. At the optional setting mode, the indication on the remote control switch is changed as shown below.

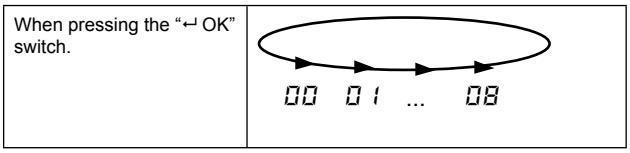


❶ The indications of “ADDS” and “RN” are turned OFF.
❷ The setting condition of the optional function is indicated in the segments of the time indication of the timer setting.
❸ The item number of the optional function is indicated in the segment for the set temperature indication.

b. Press the DAY ▼switch or the SCHEDULE ▲ switch. Then, the port indication at the segments for time indication of the timer setting changes as shown below. Select the port for allocating the input signal and the output signal.



c. Press the “↵OK” switch. Then, the input signal code and the output signal code at the segments for the setting temperature indication changes as shown below. Select the input signal and the output signal that you need to allocate to the port.



- **Return to normal mode from the optional functions setting mode**
  Press the “RESET” switch to memorize the optional functions settings and return to normal mode.

- **Selection of other indoor unit**
  When in optional settings mode, press the “TEMP ⌃” switch or the “TEMP ⌄” switch, the condition of the remote control switch is changed so that the Indoor Unit can be selected to set the optional function described above.

- **Setting items of the optional functions**

Legend		
● Individual	AA AA Not individual	—— Not used

NOTE
- "●" *Individual: This function can be selected individually for each indoor unit controlled by the same RCS.* - *"AA AA" Not individual (all units): This function can be selcted for all indoor units controlled by the same RCS. It is necessary to select "AA AA" before set.* - *Items marked with "——" are not used. Do not change its setting condition "00".*

	Item.	Optional functions	Setting	Contents of parts	Content
●	b1	Removal of heating temperature calibration	00	Not available	This function is used to eliminate the 4 °C shift.
			01	Available	
●	b2	Circulator function at heating thermo-OFF	00	Not available	This function is to avoid the stratification of air.
			01	Available	
●	b3	Enforced 3 minutes minimum operation time of compressor	00	Not available	This function is used to guard the compressor when it frequently starts and stops
			01	Available	
●	b4	Change of filter cleaning time	00	Std.	With this function is possible to change the time when the remote controller advise about when is necessary to change the air filter.
			01	100 hours	
			02	1200 hours	
			03	2500 hours	
			04	No indication	
- AA AA	b5	Fixing the operation mode	00	Not available	This function eliminates the possibility of changing operation mode from RCS or central control
			01	Available	
- AA AA	b6	Fixing the setting temperature	00	Not available	This function eliminates the possibility of changing setting temperature from RCS or central control
			01	Available	
- AA AA	b7	Fixing of operation as exclusive cooling unit	00	Not available	This function eliminates heating mode from RCS or central control
			01	Available	
- AA AA	b8	Automatic COOL/HEAT operation	00	Not available	This function changes automatically from cool to heat.
			01	Available	
- AA AA	b9	Fixing the air volume	00	Not available	This function eliminates the possibility of changing fan speed from RCS or central control
			01	Available	
——	bA	Not prepared			
●	bb	Cooling temperature compensation	00	Not available	Standard (no compensation)
			01	Available	Compensation in –1ºC
			02	Available	Compensation in –2ºC
——	bC	Not prepared	00	Not used (standard 00)	
			01		
——	bd	Not prepared	00	Not used (standard 00)	
			01		
——	bE	Not prepared	00	Not used (standard 00)	
			01		
——	C1	Not prepared			
——	C2	Not prepared			
——	C3	Not prepared			

	Item.	Optional functions	Setting	Contents of parts	Content
●	C4	Drain pump in heating	00	Not available	This function is used to activate the drain pump in heating mode.
			01	Available	
●	C5	Static pressure selection	00	Medium static pressure (factory setting)	This function is used to change the static pressure levels from the remote controller on the RPI units.
			01	High static pressure	
			02	Low static pressure	
		Increasing fan speed (RCD) (RCI)	00	Normal.	This function is used to change the fan speed due to the high ceiling.
			01	Increasing speed 1	
			02	Increasing speed 2	
●	C6	Hi speed at heating thermo-OFF	00	Not available	This function is used to increase the fan speed when Thermo-OFF
			01	Available	
●	C7	Cancelling of enforced 3 minutes minimum operation time of compressor	00	Not available	This function is used to cancel the “enforced 3 minutes minimum operation time of compressor”.
			01	Available	
●	C8	Thermistor of remote control switch	00	Control by indoor suction thermistor	This function is used to control the unit with the thermistor of remote control.
			01	Control by thermistor of remote control switch	
			02	Control by average value of indoor suction thermistor and thermistor of remote control switch	
——	C9	Not prepared			
——	CA	Not prepared			
- AA AA	Cb	Selection of forced stoppage logic	00	Forced stoppage input A contact	With this function we select the forced stoppage logic.
			01	Forced stoppage input B contact	
——	CC	Not prepared			
——	Cd	Not prepared	00	Not used (standard 00)	
			01		
——	CE	Not prepared	00	Not used (standard 00)	
			01		
●	CF	Change of louver swing angle	00	Standard (7 steps)	
			01	Draft prevention (5 steps)	For draft prevention option, the two last louver position will be not available
			02	High ceiling (5 steps)	For high celing option, the two first louver position will be not available
●	d1	ON/OFF 1 unit power supply	00	Not available	This function retains the settings of the unit if power supply is interrupted. The unit will start when power is restored.
			01	Available	
——	d2	Not prepared			
●	d3	Restart function after power failure	00	Not available	This function retains the settings of the unit if power supply is interrupted. The unit will restart when power is restored if the unit was ON before the power failure
			01	Available	
●	d4	Prevention cooling for discharge air temperature decrease	00	Not available	
			01	Available	
●	d5	Prevention heating for discharge air temperature decrease	00	Not available	
			01	Available	
●	d6	Room temperature control for energy saving	00	Not available	
			01	Available	
——	d7	Not prepared	00–07	Not used (standard 00)	
——	E5	Not prepared			
●	E6	Indoor fan operation timer after cooling operation stopage	00	Not available	This function delays the indoor fan start
			01	60 minutes	
			02	120 minutes	
——	E7	Not prepared	00	Not used (standard 00)	
			01		

	Item.	Optional functions	Setting	Contents of parts	Content
●	E8	Fan operation control at heating thermo OFF	00	Not used (standard 00)	
			01		
——	E9	Not prepared	00	Not used (standard 00)	
			01		
——	EA	Not prepared	00	Not used (Standard 00)	
			01		
			02		
●	Eb	Fan operation control at cooling thermo OFF	00	Available	
			01	Low	
			02	Slow	
●	EC	Forced thermo-ON stoppage at cooling	00	Available	
			01	Not available	
——	Ed	Not prepared	00	Not used (standard 00)	
			01		
●	EE	Automatic fan speed control	00	Available	
			01	Not available	
- AA AA	F1	Automatic setting for OFF timer (only available for PC-P1HE)	00	No function	This function is used to set the OFF timer function automatically when the unit is started by the remote control switch.
			01	OFF timer by 1 hour	
			02	OFF timer by 2 hours	
			~	...	
			23	OFF timer by 23 hours	
			24	OFF timer by 24 hours	
- AA AA	F2	Remote control main-sub setting	00	Main	This function is used when to remote control are installed in one system.
			01	Sub	
——	F3 to F7	Not prepared	-	Not prepared	-
- AA AA	F8	Mode lock	00	Not available	This function eliminates the possibility of changing operation mode from RCS, but it is possible from central control.
			01	Available	
- AA AA	F9	Temp lock	00	Not available	
			01	Available	
- AA AA	FA	Fan lock	00	Not available	This function eliminates the possibility of changing fan speed from RCS or central control
			01	Available	
- AA AA	Fb	Louver lock	00	Not available	
			01	Available	
- AA AA	Fc	Cooling temperature range limit	00~10	Standard 00	+1 ~ +10ºC
- AA AA	Fd	Heating temperature range limit	00~10	Standard 00	-1 ~ -10ºC
●	FE	Heating automatic operation temp.	00	5ºC	
			01	10ºC	
			02	15ºC	

5.2.2. Optional functions of the remote control switch

Removal of heating temperature calibration (b1)

This function is used when the temperature settings of the remote control switch and the suction air temperature of the indoor unit are required to be equal.

In standard heating operation, the suction air temperature is higher than the room temperature, therefore the suction air temperature is calibrated at – 4 °C.

(Indicated setting temperature = suction air temperature –4 °Ç return to 0 °C)

This is useful when the thermistor at the suction side of an Indoor Unit is removed and installed into another place.

Circulator function at heating thermo-OFF (b2)

If fan speed LOW is selected at heating thermo-OFF, the air of the room might become stratified because warm air stagnates near the ceiling. In this case, it is recommended that the circulator function explained below be used.

<Circulator function>

The function keeps the fan speed at thermo-OFF at the same level as thermo-ON. In this case, air movement in the room

will be kept on the same level as thermo-ON, ensuring a homogenous air distribution. In the case that an auto louver is equipped, this operation will be also held on when the heating is turned thermo-OFF.

	NOTE
- *Perceptions of coolness, heat and air flow are subject to personal preferences and behaviours.* - *It is therefore recommended to discuss this with customers thoroughly and then, set the unit accordingly.*	

Enforced 3 minutes minimum operation time of compressor (b3)

When a compressor frequently starts and stops in short intervals, this function should be used to guard the compressor. By setting this function, the mode of a minimum 3 minutes operation will be added. (The mode of a minimum 3 minutes stoppage is standard.)

In case of SET-FREE, this function is standard even when setting is not available.

	NOTE
- *When the safety device is activated or the "ON/OFF" switch is pressed, the compressor is stopped immediately.*	

Change of filter cleaning time (b4)

The period for filter sign indication is set for each indoor unit model when shipping. The filter sign is indicated according to the filter cleaning time (factory-setting). However, this filter cleaning time can be changed depending on the condition of the filter as shown in the next table.

	Period for filter sign indication			
	Approx. 100 hours	**Approx. 1200 hours**	**Approx. 2500 hours**	**No indication**
In case of 4-way cassette type	Changed period	Changed period	Factory setting	Changed period
Liquid crystal display on remote control switch	01 b4	02 b4	03 b4 *or* 00 b4 (*)	04 b4

(*) For the RPK model, the factory setting is 200 hours

Fixing the operation mode (b5)

This function is used when changes in operation modes are not required. When this function is valid, the operation mode that has been set cannot be changed.

Fixing of setting temperature (b6)

This function is used when changes in setting temperature are not required. When this function is valid, the setting temperature that has been set cannot be changed.

Fixing of operation as exclusive cooling unit (b7)

This function is used when exclusive cooling operation is required. This function invalidates the heating operation and the automatic COOL/HEAT operation, as the operation of exclusive cooling unit.

Automatic COOL/HEAT operation (b8)

This function is used to operate the unit with changing cooling and heating operation automatically.
This function is invalid when the outdoor unit is cooling only model or the function of "fixing operation as exclusive cooling unit" is valid.

Fixing of fan speed (b9)

This function is used to fix the fan speed. When this function is valid, the fan speed is not changes by the remote control switch.

Not prepared (bA)

Cooling Setting Temperature Compensation (bb)

This function is used to provide the longer cooling operation time. When this function is valid, Thermo-ON/OFF is controlled under the lower temperature conditions than the setting temperature (indicated value) of the remote control switch.

Setting Temperature for Room Temperature Control at Cooling

Setting Condition	Actual Control Temperature
00 (Standard)	Remote Control Switch Setting Temperature (Indicated Value)
01	Remote Control Switch Setting Temperature (Indicated Value) -1ºC
02	Remote Control Switch Setting Temperature (Indicated Value) -2ºC

NOTE

- *The setting temperature lower limit after compensation is 19ºC.*

Not prepared (bC)

Not prepared (bd)

Not prepared (bE)

Not prepared (C1)

Not prepared (C2)

Not prepared (C3)

Drain pump in heating (when the humidifier is installed) (C4)

This function is used to operate the drain pump in heating operation.

High speed (C5)

This function is used to increase the fan speed due to the high ceiling. (Only available for RCI and RCD Units). In case of RPI units, this setting is used to select the static pressure.

High speed at heating thermo-OFF (C6)

This function is used to increase the fan speed with function **(C5)** when thermo-OFF in heating operation. (The fan speed is not increased when thermo-OFF in heating operation at the function **(C5)** setting). (Only available for RCD units).

Canceling the enforced 3 minutes minimum operation time of compressor (C7)

In case of SET-FREE, the “enforced 3 minutes minimim operation time of compressor” described in item (3) is the standard function.

This function is used to cancel the “enforced 3 minutes minimum operation time of compressor” function.

Remote control switch thermistor (C8)

This function is used to control the unit by the built-in thermistor of the remote control switch (remote control thermistor) instead of the thermistor for suction air.

Set it at “01” or “02” when you use it.

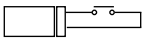
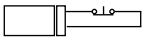
However, even when this function is set at “01” or “02” if the temperature detected is abnormal due to the failure of the remote control thermistor. etc., the indoor unit suction air thermistor is used automatically.

Not prepared (C9)

Not prepared (CA)

Selection of forced stoppage logic (Cb)

This function is used to select the logic of the contact for forced stoppage signal input. The setting condition and the logic of the contact are as shown below.

Setting condition				
↓	Logic of contact	Sequence	Activation contact	
			"Open"	"Close"
00	Contact A		Normal.	Enforced stoppage
01	Contact B		Enforced stoppage	Normal.

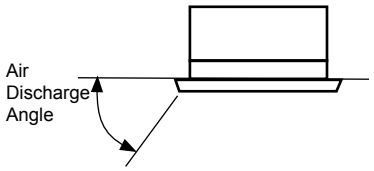
Not prepared (Cd)

Not prepared (CE)

Change of Louver Swing Angle (CF)

This function is used to change the Louver swing angle

Setting condition	Louver Swing Angle (Air Discharge Angle)	Purpose
00	Approx. 30º to 60º	Standard Operation
01	Approx. 30º to 50º	Draft Prevention
02	Approx. 40º to 60º	For High Ceiling



Power supply ON/OFF 1 (d1)

This function is used to start and stop the unit according to the power supply ON/OFF. When this function is used in the condition that there is no person to operate the unit, make the system with monitoring for disaster prevention.

	NOTE
-	*The unit is started and stopped according to the power supply ON/OFF due to the power failure. When the power failure is occurred during stoppage by the remote control switch operation, the unit is started again automatically after the power supply is recovered.*

Not prepared (d2)

Restart function after power failure (d3)

This function is used to start the unit operation again automatically when the power supply is recovered after the power failure over 2 seconds.

The standard unit is started operation again automatically with all the same operating conditions such as operation mode, etc. in case of the power failure within 2 seconds.

(The compressor unit is started operation again after three minutes guard in addition to 2 seconds power failure as a maximum.)

	NOTE
-	*In case of power failure during the unit stoppage, the unit is stopped after recovering the power supply.*

Prevention for Cooling Discharge Air temperature decrease (d4)

This function is used to change Thermo-ON/OFF conditions at cooling operation and prevent discharge air temperature decrease. In the result, the perception of cold draft is eliminated.

<Thermo-OFF Conditions>

(a) Cooling Operation (including Dry Operation) and

(b) Indoor air discharge temp. <11ºC has been kept for 3 minutes.

(Thermo-OFF when discharge air temperature is low.)

<Thermo-ON Conditions>

(a) Indoor discharge air temp. >13ºC and

(b) Thermo-ON depends on indoor discharge air temperature.

(Not Thermo-ON when discharge air temperature is low.)

Prevention for Heating Discharge Air temperature decrease (d5)

This function is used to prevent discharge air temperature decrease by lowering actual fan speed than the indications on the remote control switch.

Indications on Remote Control Switch	Actual Fan Speed
HIGH	MEDIUM
MEDIUM	LOW
LOW	LOW

5

Room Temperature Control for Energy Saving (d6)

When outdoor temperature air thermistor is detecting that the air-conditioning load is low from the outdoor temperature. This function is used to automatically save energy.

Nor prepared (d7)

For the following optional functions, please refer to Econofresh or KPI proper service manual.

- Ventilation mode (KPI) (E1)
- All fresh operation (econofresh) (E1)
- Increasing supply air volume (KPI) (E2)
- Enthalpy sensor (econofresh) (E2)
- With humidifier (indication only) (KPI) (E3)
- Precooling/preheating period (KPI) (E4)
- Gas sensor (econofresh) (E4)

Not prepared (E5)

Indoor fan operation timer after cooling operation sttopage (E6)

This function is used to prevent dew condensation “SLOW” indoor fan operation (for 60 minutes or 120 minutes depending on the setting) while cooling operation is stopped. Additionally, it is effective to prevent fangs or abnormal odor.

Not prepared (E7)

Fan operation control at heating thermo OFF (EB)

This function is used to prevent the perception of cold draft by reducing indoor fan speed at heating thermo-OFF.

Setting Condition	Fan Operation at Thermo-OFF
00	LOW
01	SLOW (*)
(*): If THM4 (remote sensor) is connected, the fan speed will be stop during heating thermo OFF.	

Not prepared (E9)

Not prepared (EA)

Fan operation control at cooling thermo OFF (Eb)

This function is used to control odor diffusion and humidity level indoor fan speed at cooling thermo-OFF.

Setting Condition	Fan Operation at Thermo-OFF
00	Operation at Setting Fan Speed
01	LOW
02	SLOW

Forced thermo-on stoppage at cooling (Ec)

This function is used to stop operation by forced thermo-ON when cooling operation is stopped.

It is effective to prevent abnormal odor because the heat exchanger is kept in the clean condition such as the heat exchanger is rinsed with drain water.

Automatic fan speed control (EE)

This function is used to economize the operation. The fan speed is automatically controlled when the room temperature is near the setting temperature. Available for PC-ART and all indoor units except RPI-(8.0/10.0)FSN2E.

Fan speed setting	Fan speed
“High”	“High”→“Mid”→“Low”
“Mid”	“Mid”→“Low”
“Low”	“Low” (No charge)

Automatic setting for OFF timer (F1)

This function is used to turn on the OFF timer of the indoor units.

Setting condition		Contents of parts
00	Not available	OFF timer not set
01 ~ 24	Available	Turns OFF after running for 1 hour
		Turns OFF after running for 24 hour

Remote control main-sub setting (F2)

This function is used to set two remote-control switches in a same installation; one in main mode and the other one in sub mode.

Setting condition		Contents of parts
00	Main	The remote control switch is set as main
01	Sub	The remote control switch is set as sub

Mode lock (F8)

This function is used to lock the operation mode.
The setting condition is showing below

Setting condition		Contents of parts
00	Not available	-
01	Available	-

Temperature lock (F9)

This function is used to lock the temperature.
The setting condition is showing below

Setting condition		Contents of parts
00	Not available	-
01	Available	-

Fan lock (FA)

This function is used to lock the fan.
The setting condition is showing below

Setting condition		Contents of parts
00	Not available	-
01	Available	-

Louver lock (Fb)

This function is used to lock the louver.

The setting condition is showing below

Setting condition		Contents of parts
00	Not available	-
01	Available	-

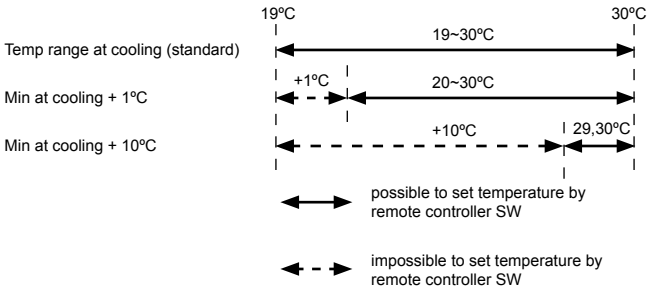
Cooling temperature range limit (FC)

This function is used to set the the temperature range in cooling mode. This function allows reducing the cooling range, to configurate trough the remote control switch.

The setting condition is showing below

Setting condition		Contents of parts
00	Not available	-
01 ~ 10	Available	Working range is reduced in 1ºC, increased the lower limit in 1ºC
		Working range is reduced in 10ºC, increased the lower limit in 10ºC

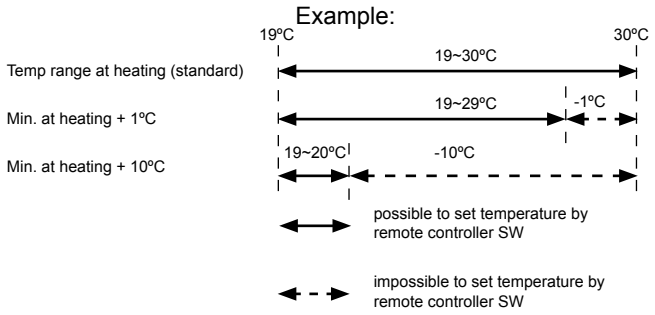
Example:



Heating temperature range limit (Fd)

This function is used to set the the temperature range in heating mode. This function allows reducing the Heating range, to configurate trough the remote control switch.
The setting condition is showing below

Setting condition		Contents of parts
00	Not available	-
01 ~ 10	Available	Working range is reduced in 1ºC, decreased the upper limit in 1ºC
		Working range is reduced in 10ºC, decreased the upper limit in 10ºC



Heating automatic temperature range limit (FE)

This function is used to avoid anti-froze water pipe protection. The unit will be activated from setting temperature until 19 ºC
The setting condition is showing below

Setting condition		Contents of parts
00	Not available	-
01	Available	Setting temperature 5ºC
02		Setting temperature 10ºC
03		Setting temperature 15ºC

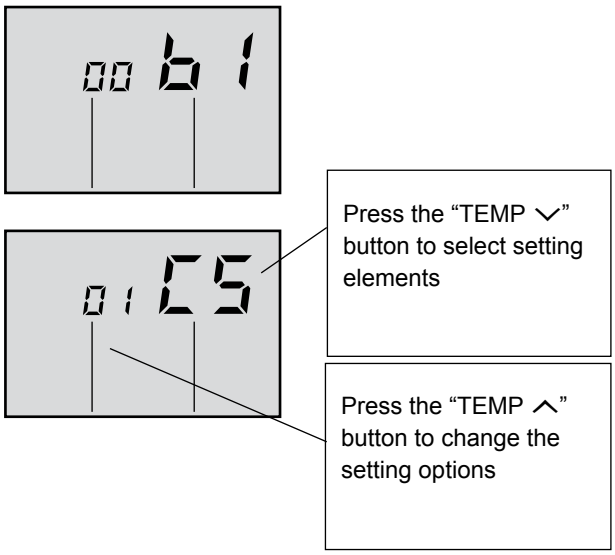
5

5.3. Available optional functions through the remote control switch (PC-ARH)

1. **Switching to optional setting mode:**
   Press the “MODE” and “FAN SPEED” buttons at the same time for at least 3 seconds when the air conditioning unit is off.
   The screen will change, as shown in the diagram, when optional setting mode is activated.

2. **Changing options and setting elements:**
   Press “V TEMP” to change certain setting elements when shown.
   To change setting options, press the “TEMP ” button.
   Consult the following table for setting elements and options.

3. **Cancelling the function selection mode:**
   To return to normal mode from 2., press the “MODE” and “FAN SPEED” buttons at the same time.



- **Optional setting elements**

Code	Element	Setting
b1	Cancelling heating temperature setting	00: Normal (temperature setting +4 °C) 01: Cancelled (temperature setting) 02: Temperature setting +2 ºC *1
b8	Automatic cooling/heating mode	00: Off 01: On
C5	Indoor fan increase	00: Off 01: High 1 02: High 2
C8	Remote control thermostat *2	00: Off 01: Switch from indoor inlet thermistor to remote control thermostat 02: Unit control using the average value of the indoor inlet thermistor and the remote control thermostat
F2	Setting primary and secondary remote controls	00: Primary 00: Secondary
FC	Minimum setting for cooling temperature *3	00: Normal temperature margin 01-10: Minimum cooling limit +1 ºC - +10 ºC
Fd	Maximum setting for heating temperature *4	00: Normal temperature margin 01-10: Maximum heating limit -1 ºC - 10 ºC
H1	Maintenance alarm	00: Show 01: Hide
H2	No automatic control indication	00: Show 01: Hide
H3	Operation mode change restriction *5	00: Operation mode change off (hide operation mode) (factory setting) 01: Operation mode set by the central control unit + “FAN” mode 02: Unlimited operation
H4	Ventilation changeover (total heat exchanger only)	00: Air conditioning only 01: Ventilation only 02: Air conditioning + ventilation
H5	Central control available after forced stoppage.	00: Off 01: On

*1. Certain indoor units do not accept the setting “02”.
*2. If installed on a bedside table, use the setting “00”.*3. Applies to “FAN”, “COOL” and “DRY” modes.*4. Applies to “HEAT” mode.*5. “01” is only available when using a remote control. Do not use this setting when using two remote controls (primary/secondary).

NOTE
- *When connecting several indoor units, the same settings are applied to all units.* - *To change the settings, wait at least three minutes after switching the power on.* - *Some indoor and outdoor units do not accept certain settings or do not have the functions that relate to the activated settings. Check the available settings beforehand.* - *Note down the option selected in the "settings" column on the table.*

5.3.1. Alarm indication

The run LED (green) will flash. The LCD screen will show the following information:

– No. of indoor unit affected by the alarm.
– Alarm code.
– Unit model.
– No. of indoor units connected to the system.

NOTE
- *For more information on alarm indications, check the installation and operation manual for the outdoor unit.*

5.4. Available optional functions through wireless remote control switch (PC-LH3A + receiver)

You can adjust the following optional functions with the DIP switches of the receiver.

PC-RLH8/9/11

Optional function	DIP switch			
	1	2	3	4
Setting of sub receiver part	○	-	-	-
Identifying the indoor unit	-	○(1)		

(1) Only for PC-ALHD, 11, 13

	NOTICE
-	*Turn OFF all the power sources before setting the DIP switches.*

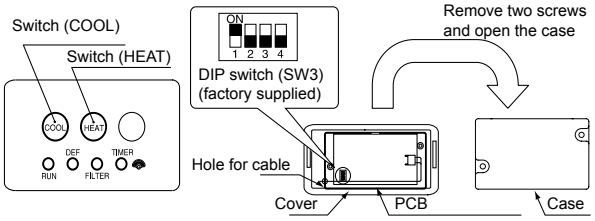
Setting of sub-receiver part

For this optional function set pin marked with ❶ to ON.

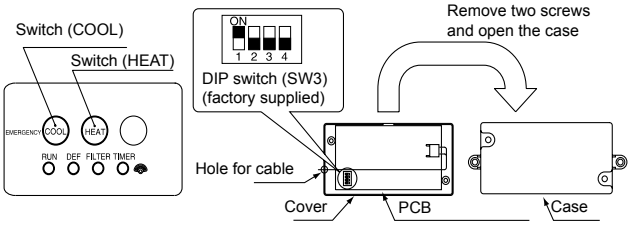
PC-RLH8/9/11/13

Open the lid of case by removing two screws so that the following functions are available.

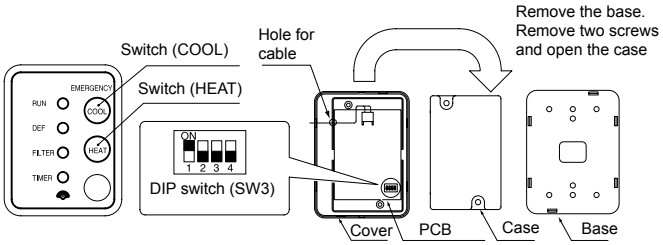
PC-ALH



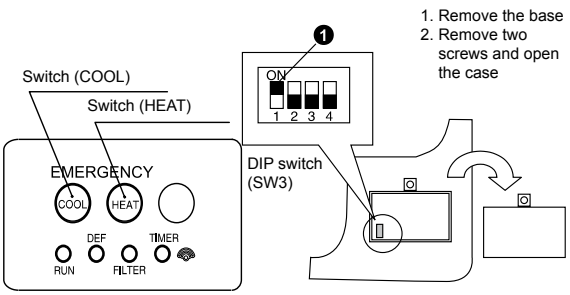
PC-ALHD



PC-ALHZ



PC-ALHC



6. Test Run

Contents

6. Test run 111
6.1. Checking procedure before the test run 112
6.2. Test run procedure using the remote control switch 114
6.3. Test run procedure using the wireless remote control switch 115
6.4. Test run procedure from the outdoor unit side 117
6.5. Normal operation pressure 118
6.6. Check list 120

6.1. Checking procedure before the test run

When the installation is finished, perform the test run according to the following procedure. After performing the test run, hand over the system to the customer.
Perform the test run of the indoor units one by one in order.
Make sure that the electrical wiring and the refrigerant piping are correctly connected.
Start the indoor units one by one in order to make sure that the indoor units are correctly numbered.
You should perform the test run according to the “7.2 Test Run Procedure” on the next page.

⚠	***WARNING***

- *General warning. Injuries of several kinds.*
  - *Do not operate the system until all the check points have been cleared.*
  - *Make sure that the stop valves of the outdoor unit are fully open. Then, start the system.*
  - *Make sure that the switch on the main power source has been ON for more than twelve hours in order to warm the compressor oil by means of the oil heater.*
  - *Do not push the button of the magnetic switch(es).*
  - *Make sure that the stop valve of the gas line and the stop valve of the liquid line are fully open.*
- *Electrical hazard. Can cause serious injuries or death. Measure the resistance between the ground and the terminal of the electrical components. Make sure that the electrical resistance is more than 1 MΩ. Otherwise, do not operate the system until you find the electrical leakage and you repair the electrical leakage. Do not impress the voltage on the terminals for transmission 1 and 2.*
- *Burning surface. Heat wounds. Do not touch any of the parts at the discharge gas side with your hands because the compressor chamber and the pipes at the discharge gas side are hot, at a temperature higher than 90°C.*
- *Electrical discharge. Can cause serious injuries. Do not touch any electrical components for more than three minutes after turning OFF the main switch.*	

- **Checking procedure**

1. Make sure that the stop valve of the gas line and the stop valve of the liquid line are fully open.

2. Make sure that there is no refrigerant leakage. The flare nuts sometimes loosen because of the vibration during the transportation.

3. Make sure that the refrigerant piping and the electrical wiring belong to the same system Make sure that the setting of the unit number of DSW1, DSW6 and RSW1 of indoor units correspond to the system.

4. Make sure that the setting of the DIP switches on the printed circuit board of the indoor units and the outdoor units are correct. Especially, pay attention to the setting of the lift between the indoor units and the outdoor units. Refer to chapter 3 “Electrical Wiring” for details.

5. Make sure that the switch on the main power source has been ON for more than twelve hours in order to warm the compressor oil by means of the oil heater.

6. Check whether or not the electrical wiring of the indoor units and the outdoor units are connected as shown in chapter 3 “Electrical Wiring”.

7. Make sure that each wire terminal (L1, L2, L3 and N, or L1 and N for single phase) is correctly connected at the power source.

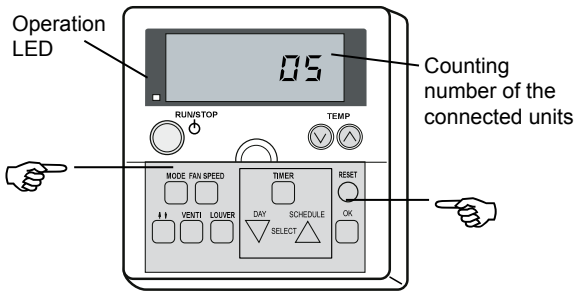
NOTE

- *Make sure that the field-supplied electrical components (main switch fuse, fuse-free breaker, earth leakage breaker, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data in the technical catalog of the unit. Also, make sure that the field-supplied electrical components comply with the national codes and the local codes.*
- *Use the shielded cables for the field wiring in order to avoid the electrical noise. (The length of the shielded cable should be less than 1,000 m. The size of shielded cable should comply with the local codes.)*
- *Make sure that the terminals for the power supply wiring ("L1" to "L1" and "N" to "N" of each terminal board for AC380-415V. "R" to "R" and "T" to "T" of each terminal board for AC220V) and the terminals for the intermediate wires between the indoor unit and the outdoor unit (Operating Line: terminals of each terminal board for DC12V) coincide correctly. Otherwise, you may damage some components.*
- *Check to ensure that the crankcase heater is turned ON for more than 4 hours. The operation is not available within 4 hours after turning ON the power supply.*
- *Check to ensure that the main source has been ON for more than 12 hours to warm the compressor oil by the oil heater.*
- *Check to ensure the operating temperature:*
  - *Cooling operation:*
  - *Indoor DB21.5 ºC and above,*
    Indoor WB16 ºC and above,
    Outdoor DB0 ºC and above.
- *Heating operation:*
  Indoor DB27 ºC and below.
- *The compressor is NOT available within 4 hours after turning ON the power supply.*
- *(Stoppage code: d1-22) If the compressor should be within 4 hours, turn ON the power and wait for more than 30 seconds. Press PSW1 and PSW3 on the outdoor PCB simultaneously for more than 3 seconds. The forced thermo-OFF function (d1-22) is canceled and the compressor operation is available.*

6.2. Test run procedure using the remote control switch

❶ Turn ON the power source of the indoor units and the outdoor units

❷ Set the TEST RUN mode by means of the remote control switch.
Press the MODE switch and the OK switch simultaneously for more than three seconds.
a) If the TEST RUN indication and the counting number of the connected units to the remote control switch (for example "05") are displayed on the remote control switch, the connection of remote control cable is correct. Go to ❹.
b) If no indication or "00" appears or if the number of the units that is displayed is smaller than the actual number of the units, there is some abnormal operation.
Go to ❸.



❸

RCS indication	Fault	Inspection points after the power source is OFF
No indication	– The power source is not turned ON. – The connection of the remote control cable is incorrect. – The connect wires of the power supply line are incorrect or loosened.	1. The connection between the remote control and the unit is correct. 2. Connecting points of the remote control cable. 3. The contact of the connectors of the remote control cable. 4. The screw fastening of each terminal board.
The counting number of the connected units is incorrect	– The power source of outdoor unit in not turned ON. – The setting of the unit number is incorrect. – The connection of the control cables between each indoor unit is incorrect. (When multiple units are controlled by one remote control switch).	5. Setting of the DIP switches on the printed circuit board. 6. Wire connection order of the bridge cable. 7. Connecting points of the bridge cable. 8. The contact of the connectors of the bridge cable.

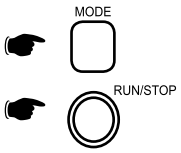
Back to ❶ after the checking

❹ Select the TEST RUN mode by pressing the MODE switch (COOL OR HEAT).

❺ Press the RUN/STOP switch.
a) The TEST RUN operation will start. (The TEST RUN operation will be finish after two hours. You can also finish the TEST RUN operation by pressing the RUN/STOP switch again).

> ***NOTE***
>
> - *TEST RUN operation ignores the temperature limitation and ambient temperature during heating operation to have a continuous operation, but the protections are alive. Therefore, the protection may activate when the heating TEST RUN operation is performed in high ambient temperature. TEST RUN operation time can be modifyed / increased depressing the time switch in the Remote control.*

b) If the unit does not start or if the operation LED on the remote control switch is flickering, there is some abnormal operation. Go to ❻.



❻

RCS indication	Unit condition	Fault	Inspection points after the power source is OFF
The operation LED flickers. (1 time / 1 sec.) and the unit number and the alarm code "03" flicker.	The unit does not start	The power source of outdoor unit in not turned ON. The connect wires of the operating line are incorrect or loosened.	1. The connection order of each terminal board. The fuse on the PCB may have blown out due to an incorrect wiring. ***NOTE*** - *Recovering method of FUSE for operating circuit. There is a fuse (FUSE4 on Indoor Unit PCB1, EF1 on Outdoor unit PCB1) to protect operating circuit on the PCB, when the power lines are connected to operating lines. If fuse is melted, operating circuit can be recovered once by setting the dip switch on the PCB as shown in ❼* 2. The screw fastening of each terminal board. 3. The connection order of the power supply wire between the indoor units and the outdoor units.
The operation LED flickers. (1 time / 2 sec.)	The unit does not start	The connection of the remote control cable is incorrect.	This is the same as the item ❸ 1, 2, and 3
The flickering indicator is different from the one above	The unit does not start. The unit starts once and then the unit stops.	The connection of the thermistor or other connectors is incorrect. There is tripping of the protector.	Check the alarm code table in the service manual. (Service personnel should do the checking).
The operation lamp Flickers. (1 Time/1s) Unit No. 00LU, Alarm Code dd and Unit Code E00LU flicker	The unit does not start.	The connection of the remote control cable between Indoor Units is incorrect.	Check by the abnormality mode table in the Technical Catalog (Do it by service people).

Back to ❶ after the checking

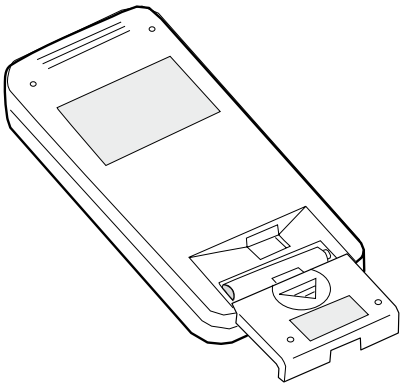
❼ Instructions for the recovery when the fuse of the transmission circuit is blown out:
1. Correct the wiring to the terminal board.
2. Set the 1st pin of DSW7 on the indoor unit PCB to ON.
   Only for RPK-1.0/1.5:
   Set the 2nd pin of DSW7 on the indoor unit PCB to ON.

Except RPK 1.0/1.5	Only RPK-1.0/1.5

6.3. Test run procedure using the wireless remote control switch

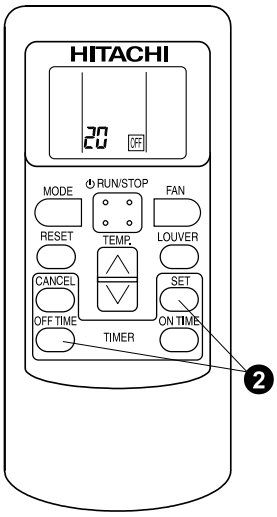
NOTE

- *If the wired remote control switch is used or if multiple units (SET-FREE, DC INVERTER and utopia series) are operating simultaneously, you cannot perform the test run by means of the remote control switch. If that is the case, perform the test run by means of the wired remote control switch.*



1. Perform the test run after completing the installation.
   a) Set the batteries for the remote control switch.
   b) Turn ON the power source of the indoor units and the outdoor units.
   c) The yellow '((' LED on the receiver of the indoor unit flickers (0.25 seconds ON ↔ 0.25 seconds OFF). Then, the yellow LED turns OFF. While the LED is flickering, the unit will not operate because the unit is initializing.

2. Set the TEST RUN mode by pressing the SET switch and the OFF TIME switch simultaneously for more than three seconds. The LCD should look like the LCD on the right figure.
   The TEST RUN mode is not operating

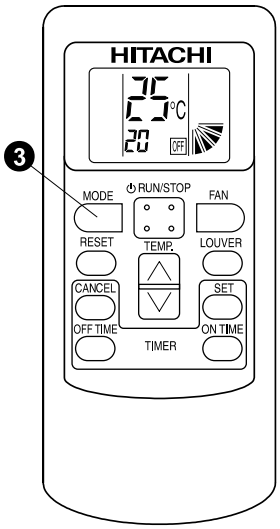


3. Set the operation mode by pressing the MODE switch. The TEST RUN mode is operating.

4. Operate the test run by pointing the transmitter towards the receiver of the indoor unit. Then, press the RUN/STOP switch. When the indoor unit receives the commands, the yellow '((' LED of the receiver will turn on briefly.
   Make sure that the commands are received well and the selected mode 3) is set correctly.
   In the TEST RUN mode, the red RUN LED of the receiver is turned ON and the green TIMER LED flickers (0.5 seconds ON ↔ 0.5 seconds OFF) (*2). Then, the timer switches off for two hours.

NOTE

- *If the yellow '((' LED does not turn ON, the commands from the remote control switch may not have reached the receiver. Send the commands again.*
- *(*2) In the case of the RPK model, the TIMER LED is turned OFF.*



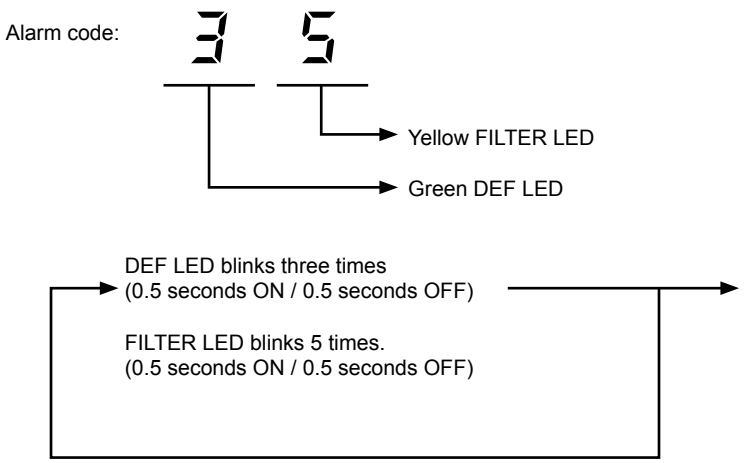
5. Adjust the angle of the air grille as follows.
   The air louver has a mechanism for the auto-swing function. Do not move the louver by hand forcefully.
   a) Select the FAN mode by pressing the MODE switch.
   b) Set the louver angle by pressing the LOUVER switch.

6. Stop the test run (normal)
   a) The test run stops automatically after two hours.
   b) You stop the test run by pressing the RUN/STOP switch again.
      After the test run has finished, check that the red RUN LED and the green TIMER LED turn OFF.
7. Stop the test run (abnormal) for the PC-RLH 9/11.
   If you cannot use the PC-LH3A because of battery shortage or any other reason, perform the emergency operation as follows.
   a) COOL switch: Press the COOL switch in order to start the cooling process.
      Press the COOL switch again in order to stop the cooling process.
   b) HEAT switch: Press the HEAT switch in order to start the heating process.
      Press the HEAT switch again in order to stop the heating process.

	NOTE
-	*During the emergency operation, the yellow LED blinks (0.5 seconds ON / 0.5 seconds OFF).*

   c) Alarm code display
      - If some malfunction occurs because of the activation of a safety device or any other reason, the red RUN LED blinks (0.5 seconds ON / 0.5 seconds OFF).
      - Refer to the chapter 7.2.1 for the alarm code table.
      - The alarm code displays the number of blinks of the green DEF LED and the yellow FILTER LED as shown bellow:
        Green DEF LED: Digit 2 of the alarm code blinks.
        Yellow FILTER LED: Digit 1 of the alarm code blinks. (Alphabet code: A=10 blinks, B=11 blinks, C=12 blinks, etc.).

Example:

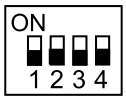

Alarm code:
3 5
Yellow FILTER LED
Green DEF LED
DEF LED blinks three times
(0.5 seconds ON / 0.5 seconds OFF)
FILTER LED blinks 5 times.
(0.5 seconds ON / 0.5 seconds OFF)

      - The red RUN LED (1 second ON / 1 second OFF) means that there is an abnormal transmission between the indoor units and the outdoor unit.

6.4. Test run procedure from the outdoor unit side

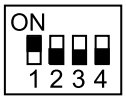
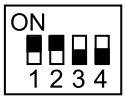
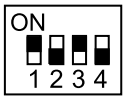
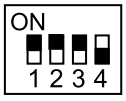
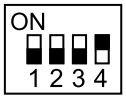
The test run procedure from the outdoor unit side is shown below.
You can set this DIP switch while the power source is ON.

- **Setting of dip switch (before shipment)**

DSW1		
	1	Cooling: Pin 1 ON
	2	Heating: Pin 1, 2 ON
	3	Cooling intermediate season: Pin 1, 3 ON
	4	Heating intermediate season: Pin 1, 2, 3 ON
	5	Manual compressor OFF: Pin 1~4 ON

	WARNING
-	*Electrical hazard. Can cause serious injuries. Do not touch any other electrical components while you are setting the switches on the PCB.*

	NOTE
-	*Set all the DIP switches of DSW1 to OFF after completing the test run.*

	Dip switch seting	Operation	Remarks
Test run	1. Setting operation mode (a) Cooling: Set DSW1-1 ON  (b) Heating SET DSW1-1 and 2 ON  (c) Cooling intermediate season: Set DSW1-1 and 3 ON  (d) Heating intermediate season: Set DSW1-1, 2 and 3 ON 	- The indoor unit automatically starts to operate when the test run of the outdoor unit is set. - You can perform the ON/ OFF operation from the remote control switch or the DSW1-1 of the outdoor unit. - Continuous operation during 2 hours is performed without the Thermo-OFF condition.	- Make sure that the indoor units start to operate in accord with the test run of the outdoor unit. - If you start the test run from the outdoor unit and you stop the test run from the remote control switch, the test run function of the remote control switch is cancelled. However, the test run function of the outdoor unit is not cancelled. - If the more than one indoor unit is connected with one remote control switch, all the units start the test run at the same time. Therefore, turn OFF the power source so that the indoor units do not perform the test run. If this is the case, the TEST RUN indication of the remote control switch may flicker. This is not abnormal. - The setting of DSW1 is not required for the test run from the remote control switch.
Manual OFF of compressor	2. Forced stoppage of compressor: Set DSW1-4 ON 	- When DSW1-4 is ON during the compressor operation, the compressor stops operating immediately and the indoor unit is under the Thermo-OFF condition. - When DSW1-4 is OFF, the compressor starts to operate after the cancellation of the 3-minute guard.	- Do not turn ON and OFF the compressor frequently.

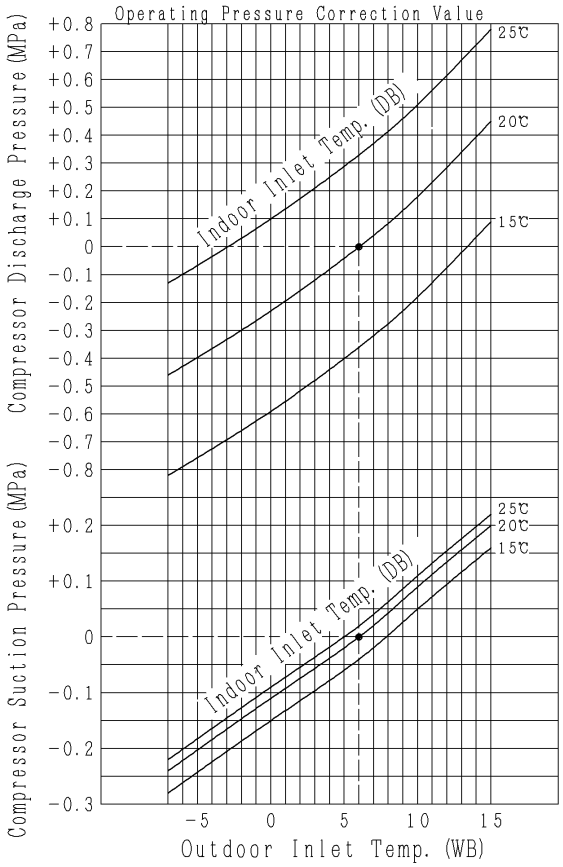
6.5. Normal operation pressure

You can check the excess or the deficiency of the refrigerant in comparision with the following charts and actual pressure measurement.

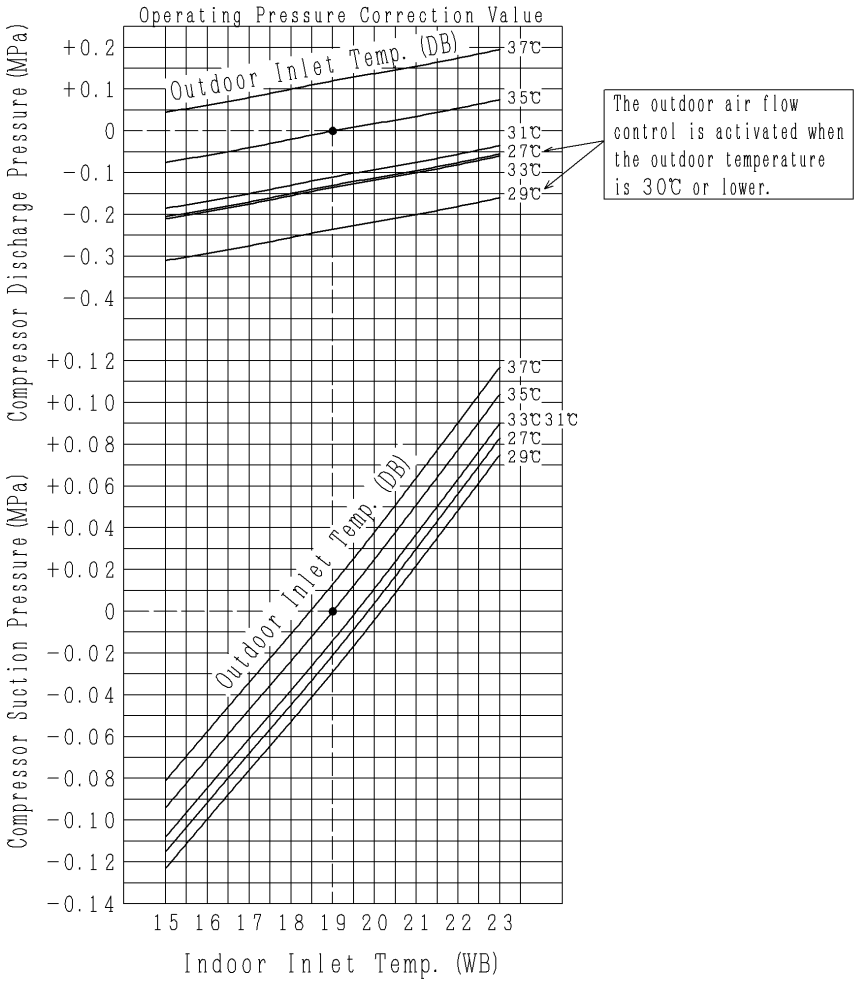
The following checking procedure is useful during test run and maintenance work.

Nominal value (MPa)			RCI	RCD	RPI	RPC	RPK
Cooling	3 HP	Pd	2.82	2.85	2.82	2.81	2.78
		Ps	0.93	0.95	0.91	0.90	0.88
Heating		Pd	2.67	2.96	2.80	2.97	3.12
		Ps	0.67	0.68	0.67	0.67	0.69
Cooling	5 HP	Pd	2.75	2.75	2.77	2.74	-
		Ps	0.80	0.80	0.79	0.79	-
Heating		Pd	2.59	2.71	2.60	2.49	-
		Ps	0.61	0.62	0.60	0.59	-

- **Heating operation pressure correction values for models RASC-(3/5)H(V)RNE**



- **Cooling operation pressure correction values for models RASC-(3/5)H(V)RNE**



6

NOTE
- *The above curves indicate pressures under the following conditions:* - *Indoor Fan Speed: HIGH* - *Indoor total capacity: 100% compared with the capacity of the outdoor unit. (Connected 1 indoor unit)* - *Piping length: 7.5m (main piping: 5m, branch piping: 2.5m x 4)* - *Do not use the above data for the refrigerant charge procedure.* - *These data should be used as a reference for the checking of operating conditions.* - *Nominal Pd and Ps Indoor unit combination:*

6.6. Check list

- **Check list on test run**

MODEL: SERIAL No. COMPRESSOR MFG. No.

CUSTOMER'S NAME AND ADDRESS: DATE:

1. Is the rotating direction of the indoor coil fan correct? _____
2. Is the rotating direction of the outdoor coil fan correct? _____
3. Is there any abnormal compressor sound? _____
4. Has the unit been operating for at least twenty (20) minutes? _____
5. Check the room temperature:

Inlet:	No.1	DB	/WB	°C ,	No.2	DB	/WB	°C ,	No.3	DB	/WB	°C ,	No.4	DB	/WB	°C
Outlet:		DB	/WB	°C ,		DB	/WB	°C ,		DB	/WB	°C ,		DB	/WB	°C
Inlet:	No.5	DB	/WB	°C ,	No.6	DB	/WB	°C ,	No.7	DB	/WB	°C ,	No.8	DB	/WB	°C
Outlet:		DB	/WB	°C ,		DB	/WB	°C ,		DB	/WB	°C ,		DB	/WB	°C

6. Check the outdoor temperature:
   Inlet: DB °C , WB °C
   Outlet: DB °C , WB °C
7. Check the refrigerant temperature: Operation mode (cool or heat)
   Discharge gas temperature: Td= °C
   Liquid pipe temperature: Te= °C
8. Check the pressure:
   Discharge pressure: Pd= kg/cm²G
   Suction pressure: Ps= kg/cm²G
9. Check the voltage:
   Rated voltage _____ V
   Operating voltage: L1-L2 V, L1-L3 V, L2-L3 V
   Starting voltage: _____ V
   Phase imbalance: $1 - \frac{V}{Vm} =$
10. Check the compressor input running current
    Input: _____ kW
    Running current: _____ A
11. Is the refrigerant charge adequate?_____
12. Do the operation control devices operate correctly?_____
13. Do the safety devices operate correctly? _____
14. Has the unit been checked for refrigerant leakage?_____
15. Is the unit clean inside and outside?_____
16. Are all the cabinet panels fixed?_____
17. Are all the cabinet panels free from rattles?_____
18. Is the filter clean?_____
19. Is the heat exchanger clean?_____
20. Are the stop valves open?_____
21. Does the drain water flow smoothly from the drain pipe?_____

- **Check list on compressor**

CLIENT:	MODEL:	DATE
Serial No.:	Production date:	Checker:

No.	Check item	Check method	Result	Remarks
1	Is THM9 correctly connected? THM9: Discharge gas thermistor	(1) Is wire of thermistor correctly connected by viewing? (2) Check to ensure the 7-segment indication of Td when comp. is operating. Td: Temperature of THM9		
2	Is thermistor THM9 disconnected?	(1) Check to ensure that thermistor on the top of comp. is correctly mounted by viewing? (2) Check to ensure that actually measured temp. is the same as the indication during check mode.		
3	Is current sensor faulty?	(1) Check to ensure that indication A1 and A2 are 0 during compressor stopping. (2) Check to ensure that indication A1 and A2 are not 0 during compressor running.		
4	Is current sensing part on PCB2 faulty?			
5	Is the direction of current sensor (CTU, CTV) reverse?	Check the direction => by viewing.		
6	Are power source wires, U and V inserted correctly into current sensor?	Check to ensure that wires are correctly inserted.		
7	Is exp. valve (MV1) correctly connected?	Check to ensure that MV1 to CN5A is correctly connected.		
8	Is exp. valve (MV1) coil correctly connected?	Check to ensure that each coil is correctly mounted on the valve.		
9	Are the refrigeration cycle and electrical wiring system incorrectly connected?	Check to ensure that refrigerant is flowing into indoor units by operating one refrigerating cycle only from the outdoor unit.		
10	Is opening of exp. valve completely closed (locked)?	Check the following by the check mode of outdoor units. (1) Liquid pipe temp. (TL) < air intake temp. (Ti) during cooling operation (2) Liquid pipe temp. (TL) > air intake temp. (Ti) during heating operation		
11	Is opening of exp. valve fully opened (locked)?	Check to ensure that liquid pipe temp. is lower than air intake temp. of stopping indoor unit when other indoor units are operating under cooling operation.		
12	Are the contacts for comp. magnetic switch CMC1 faulty?	Check the surface of each contact (L1, L2 and L3) by viewing.		
13	Is there any voltage abnormality among L1-L2, L2-L3 and L3-L1?	Check to ensure that voltage imbalance is smaller than 3%. Please note that power source voltage must be within 380V or 220V+10%.		
14	Is the comp. oil acidified during compressor motor burning?	Check to ensure that the oil color is not black.		

- **Additional information for “Check list on compressor”**

Check item	Additional information (mechanism of compressor failure)
1 & 2	The liquid refrigerant return volume to the compressor is controlled by the discharge gas temperature Td when compressor is operating. If Td thermistor is disconnected, the liquid refrigerant return volume will become small by detecting the temperature even if the actual discharge gas temperature is high. Therefore, this abnormal overheating by detecting the temperature operation will result in insulation failure of the motor winding.
3 & 4	Overcurrent control (operating frequency control) is performed by detecting current by the PCB2. In this case, winding insulation failure will occur, since control is not available in spite of actually high current.
5 & 6	The current sensor checks phase and adjusts output electrical wave in addition to the above mentioned items. If fault occurs, the output electrical wave becomes unstable giving stress to the motor winding, resulting in winding insulation failure.
7 & 8	During a cooling operation, SH is controlled by MV of each indoor units. During a heating operation, Td is controlled by MV1. If expansion valves are incorrectly connected, correct control is not available, resulting in compressor seizure depending on liquid refrigerant returning conditions or motor winding insulation failure depending on overheating conditions.
9	If the refrigeration cycle and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
10	If the expansion valve and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
11	The compressor may be locked due to the liquid return operation during the cooling operation.
12	In the case that the contacting resistance becomes big, voltage imbalance among each phase will cause abnormal overcurrent.
13	In this case, overcurrent will occur, efficiency will decrease or the motor winding will be excessively heated.
14	In the case, it will result in motor burning or compressor failure.

7. Troubleshooting

Contents

7. Troubleshooting 123

7.1. Initial troubleshooting 124

7.1.1. Checking using the 7-segment display 124
7.1.2. Failure of the power supply to the indoor unit and the remote control switch 125
7.1.3. Abnormal transmission between the remote control switch and the indoor unit 126
7.1.4. Abnormal operation of the devices 127

7.2. Troubleshooting procedure 135

7.2.1. Alarm code 135
7.2.2. Troubleshooting by alarm code 137
7.2.3. Troubleshooting in check mode 176
7.2.4. Troubleshooting using the 7 segment display 182
7.2.5. Cause of inverter stoppage 184

7.3. Procedure for checking each main part 187

7.3.1. Self-checking procedure of PCB using the remote control switch 187
7.3.2. Self-checking procedure of the Remote Control Switch 189
7.3.3. Checking procedure of other main parts 191

7.1. Initial troubleshooting

7.1.1. Checking using the 7-segment display

- **Simple checking procedure using the 7-segment display**
  1. Turn on all the indoor units which are connected to the outdoor unit.
  2. Turn on the outdoor unit
  3. Auto-addressing starts. (outdoor unit printed circuit board PCB 1)
     During the auto-addressing, you can check the following items using the 7-segment display of the outdoor unit.
     a) Disconnection of the power supply to the indoor unit.
     b) Duplication of the indoor unit number.

Normal case:

The 7-segment display of the outdoor unit is not indicated.

Abnormal case:

If there is something wrong, the 7-segment display of the outdoor unit displays the following indications:

Cause	Indication	Remarks
a. The indoor units are not supplied with power.	03	continues to flash after 30 seconds.
b. Disconnection of the operating line between the outdoor units and the indoor units.	03	continues to flash after 30 seconds.
c. Duplicated settings of the indoor unit number on the rotary switch RSW (Refer to the section 7.2.2, "Troubleshooting using the alarm code" for the description of the alarm code "35").		

7.1.2. Failure of the power supply to the indoor unit and the remote control switch

- **The LED and the LCD are not indicated.**

- **Not operated**
  If the fuses are blown out or a breaker is activated, investigate the cause of the overcurrent and take the necessary action.

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or power is not ON		Measure the voltage using the voltmeter	Supply the power
Blown out fuse or activation of the breaker at the power source	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the wires to earth	Measure the insulation resistance	Remove the cause of the short circuit and replace the fuse
Blown out fuse at the control circuit	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the control circuit to earth	Measure the insulation resistance	Remove the cause of the short circuit and replace the fuse
Failure of the transformer at the indoor unit side		Measure the voltage at the secondary side	Replace the transformer
Disconnected cable of the remote control switch		Connect the cable	Replace the cable or repair the cable
Insufficient contacting at the connectors of the remote control switch	Insufficient connection or incorrect connection of the indoor unit PCB	Check the connectors	Correctly connect the connector
	Insufficient connection or incorrect connection of the indoor unit PCB in the remote control switch		
Failure of the remote control switch		Check the remote control switch using the self-check mode *1)	Replace the remote control switch if it failed
Failure of PCB	Unconnected wires to PCB	Check the connectors	Correctly connect the wires
	Failure of PCB	Check PCB using the self-check mode *2)	Replace PCB if it failed
Incorrect wiring connection		Take action according to the procedure that is displayed in "TEST RUN"	

*1):Refer to section 7.3.2.
*2):Refer to section 7.3.1.

7.1.3. Abnormal transmission between the remote control switch and the indoor unit

- **RUN LED on the remote control switch:**
  Flickering every 2 seconds.

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Disconnection or insufficient contacting of the remote control cable		Check the cable and the connections	Repair the cable or connect the cable
Failure of the remote control switch		Check the remote control switch using the self-check mode *1)	Replace the remote control switch if the remote control switch is faulty
Failure of PCB (in the indoor unit and the remote control switch)	Disconnected wire to PCB	Check the connectors	Correctly connect the wires
	Failure of PCB	Check PCB using the self-check mode *2)	Replace PCB if it failed

*1):Refer to section 7.3.2.
*2):Refer to section 7.3.1.

7.1.4. Abnormal operation of the devices

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
RUN LED is ON and the LCD is indicated However, the system does not operate (For example, the indoor fan, the outdoor fan or the compressor does not operate)	Failure of the indoor unit fan motor	Disconnected coil	Measure the coil resistance using the tester	Replace the indoor unit fan motor
		Burnt-out coil	Measure the insulation resistance	
	Failure of the Outdoor unit fan motor	Disconnected coil	Measure the coil resistance using the tester	Replace the Outdoor unit fan motor
		Burnt-out coil	Measure the insulation resistance	
	Failure of the magnetic switch for the Outdoor unit fan motor	Insufficient contacting	Measure the voltage between the contacting parts	Replace PCB for the Outdoor unit
	Failure of the comp. motor		Measure the resistance between two wires	Replace the compressor
	Failure of the comp.		Check for an abnormal sound from the comp.	
	Failure of the magnetic switch for comp.	Insufficient contacting	Check that the magnetic switch activates correctly or not	Replace the magnetic switch
	Failure of one of PCBs	Disconnected wiring to PCB	Check the connections	Correctly connect the wiring
		Failure of PCB	Check PCB using the self-check mode *1)	Replace PCB if it failed
The comp. does not stop or start even if the setting temperature on the LCD changes to *3)	Failure of air inlet thermistor	Failure of thermistor	Check it by self-checking *2)	Replace or correctly connect the wires if abnormal operation exists
		Disconnection of thermistor		
	Abnormal operation of the remote control switch cord			
	Failure of the indoor unit PCB		Check PCB using the self-check mode *1)	Replace PCB if it failed

Abnormal operation of the devices (Cont.)

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
The comp. does not stop or start even if the setting temperature on LCD changes to *3)	Incorrect optional setting	Check the setting condition of "remote control thermostat" using the optional setting Setting and control: "00": Control using the indoor thermistor for the suction air "01": Control using the thermostat of the remote control switch "02": Control using the average value of the indoor thermistor for the suction air and the thermostat of the remote control switch	If the thermostat of the remote control switch is not used, set at “00”
	Incorrect input/output setting	Check setting condition of “i1” and “i2” by input/output setting. * Setting and ontrol: “01”: Room thermostat (cooling) “02”: Room thermostat (heating)	In case that room thermostat is not used, set for input signal actuallt used. If no signal is used, set at “00”

*1):Refer to section 7.3.2.
*2):Refer to section 7.3.1.
*3):Even if the remote control switches are normal, the compressor does not operate under the following conditions:

1. Indoor temp. is lower than 21°C or Outdoor temp. Is lower than -5°C during the cooling process (DB).
2. Indoor temp. is higher than 27°C (DB) or Outdoor temp. is higher than 15°C (WB) during the heating process.
3. When a cooling (or heating) process signal is given to the Outdoor unit and a different mode as heating (or cooling) process signal is given to the indoor units.
4. When an emergency stop signal is given to Outdoor unit.

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Indoor fan speed does not change	Failure of the discharge air temp. thermistor	Failure of the thermistor	Check the thermistor using the self-check mode *2)	Replace or correctly connect the wiring when it is abnormal
		Disconnected wire of the thermistor		
	Failure of the remote control switch		Check it using the self-check mode *1)	Replace if it failed
	Failure of PCB for the indoor unit			Replace if PCB fails
No defrost operation mode is available during the heating process or the defrost operation continues	Failure of thermistor for outdoor evaporating temp. during heating	Failure of thermistor	Replace or correctly connect when it is abnormal	
		Disconnected wire of thermistor		
	Failure of 4-way valve	Disconnected 4-way valve coil	Measure the resistance of coil	Replace the 4-way valve
		Incorrect activation of 4-way valve	Enforced power supply	
	Disconnected control wires between indoor unit and outdoor unit		Check the connectors	Correctly connect the wiring
	Failure of the outdoor units of PCB	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of PCB	Check PCB using the self-check mode *1)	Replace PCB when the check mode is not available
	Failure of the indoor unit of PCB	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of PCB	Check PCB using the self-check mode *1)	Replace if PCB fails
The LED and the LCD on the remote control switch remain ON	Failure of PCB in the indoor unit or the remote control switch			

*1):Refer to section 7.3.2.
*2):Refer to section 7.3.1.

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient cooling process	Indoor cool load is greater than the cooling capacity		Calculate the cool load	Use a bigger unit
	Excessively low suction pressure	Gas leakage or shortage of refrigerant	Measure superheat	Correctly charge the refrigerant after repairing the gas leakage
		Excessively small diameter tube or long piping	Measure and check the field-supplied pipes	Use the correct pipes
		Incorrect activation of the check valve of the outdoor unit	Check whether or not the temp. difference exists before/after the check valve	Replace the check valve for the outdoor unit
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
		Clogged strainer in the indoor unit; clogging at the low pressure piping	Check the temp. difference at the inlet and the outlet of the strainer	Replace the strainer in the indoor unit
		Clogging at the low pressure piping	Check the temp. difference	Remove the clogging
		Insufficient air flow to the indoor unit heat exchanger	Check for clogged air filter	Clean the air filter
			Check for an obstacle at the inlet or the outlet	Remove the obstacles
		Excessively low air temp. to the indoor unit heat exchanger	Insufficient speed of the indoor unit fan motor?	Replace the fan motor
			Short-circuited indoor unit air?	Remove the cause of the short-circuited air

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient cooling process	Excessively high discharge pressure	Insufficient air flow to the outdoor unit heat exchanger	Clogging of the outdoor unit heat exchanger?	Remove the clogging
			Obstacles at the inlet or the outlet of the outdoor unit heat exchanger	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure the service area
			Correct fan speed?	Replace the fan motor
		Excessively high air temp. to the outdoor unit heat exchanger	Short-circuited air to the outdoor unit?	Remove the cause of the short-circuited air
			Any other heat load near the outdoor unit?	Remove the Rasc Unit
		Excessively charged refrigerant	Expansion valve opening	Correctly charge the refrigerant
		Non-condensate gas in cycle	Check each temp. and each pressure	Charge the refrigerant after the vacuum pumping
		Clogging of the discharge piping	Check for clogging	Remove the clogging
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on the compressor?	Correctly install the thermistor
	Malfunction or internal leakage of the 4-way valve		Check the temp. difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Excessively low suction pressure	Malfunction or internal leakage of the 4-way valve	Check the Temp. Difference between the Inlet and the Outlet of 4-Way Valve	Replace the 4-way valve
		Failure of solenoid valve for bypass	Check refrigerant leakage of solenoid valve	Replace solenoid valve
	Discharge temp. of the indoor unit is unstable		Check the expansion valve of the indoor unit in the same system	Replace the failed expansion valve of the indoor unit

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient heating process	Indoor heat load is greater than the heating capacity		Calculate the heat load	Replace the unit with a bigger unit
	Excessively low suction pressure	Gas leakage or insufficient refrigerant charge	Measure superheat	Correctly charge the refrigerant after the gas leakage check and repairing
		Excessively small diameter or long piping	Measure the field-supplied piping	Use the specified pipes
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
		Clogging of I.U./O.U. strainer	Check the temp. difference between the inlet and the outlet of strainer	Replace the strainer for the outdoor unit or the indoor unit
		Clogging of suction piping	Check the temp. difference of each part	Remove the clogging
		Insufficient air flow through the outdoor unit heat exchanger	Is the outdoor unit heat exchanger clogged?	Remove the clogging
			Are there any obstacles at the inlet or the outlet of outdoor unit?	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure a sufficient service area
			Check the speed of the outdoor unit fan	Replace the fan motor
		Excessively low air temp. through the outdoor unit heat exchanger	Check for any short-circuited air to the outdoor unit	Remove the cause of the short-circuited air
		Defrosting is insufficiently completed	Check the thermistor for the defrost operation	Replace the thermistor for the defrost operation

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient heating process	Excessively high discharge pressure	Insufficient air flow to the indoor unit heat exchanger	Check the filter for a clogging	Remove the clogging
			Check for any obstacles at the inlet or the outlet of the indoor unit	Remove the obstacles
			Check the indoor fan speed	Replace the fan motor
		Excessively high air temp. to the indoor unit heat exchanger	Check whether or not the short-circuited air exists	Remove the cause of the short-circuited air
		Excessively charged refrigerant	Check the refrigerant quantity *1)	Correctly charge the refrigerant
		Non-condensate gas in ref. cycle	Check the refrigerant quantity *1)	Recharge the refrigerant after the vacuum pumping
		Clogging of the discharge pr. piping	Check for clogging	Remove the clogging
	Malfunction or internal leakage of the 4-way valve		Check the temp. difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Malfunction of the check valve of the outdoor unit		Check the temp. difference at the inlet and the outlet of the check valve	Replace the check valve
	Excessively high suction pressure	Malfunction or internal leakage of 4-way valve	Check the temp. difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Discharge temp. of the indoor unit is unstable		Check the expansion valve of the indoor unit in the same system	Replace the failed expansion valve of the indoor unit

*1):Refer to chapter 7 of TC.

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Cooling or heating process with an abnormal sound	Foreign particles inside of the fan casing		Visually inspect it	Remove the foreign particles
	Indoor unit fan runner is hitting the casing		Visually inspect it	Adjust the position of the fan runner
	Outdoor unit fan runner is hitting the casing		Visually inspect it	Adjust the position of the fan runner
	Abnormal sound from the compressor	Faulty Installation	Check that each part is tightly fixed	Tightly fix each part
		Liquid ref. compression	Adjust the suction gas temp. and pressure	Ensure superheat
		Wear or breakage of the internal comp. parts	Abnormal sound from the inside of the compressor	Replace the compressor
		No heating by the oil heater	Check the resistance (oil heater, fuse)	Replace the oil heater or the fuse
	Humming sound from the magnetic conductor		Check the surface of the contacts	Replace the magnetic switch
	Abnormal vibration of the cabinets		Check each fixing screw	Tightly fix each screw
Outdoor fan does not operate when the compressor operates	Obstacle at the Outdoor fan		Check the obstacles	Remove the obstacles
	Watching condition for the heating process		Wait for the switching of the 4-Way valve (1 ~ 3 minutes)	If the 4-Way valve does not switch, check for insufficient refrigerant
Indoor fan does not operate when the compressor operates	Discharge pressure does not increase higher than 1.5 Mpa due to the insufficient refrigerant		Check the operation pressure *1)	Add the refrigerant
	Disconnected wiring for the indoor fan		Check the wiring	Connect the wiring correctly

*1):Refer to chapter 10 of TC.

7.2. Troubleshooting procedure

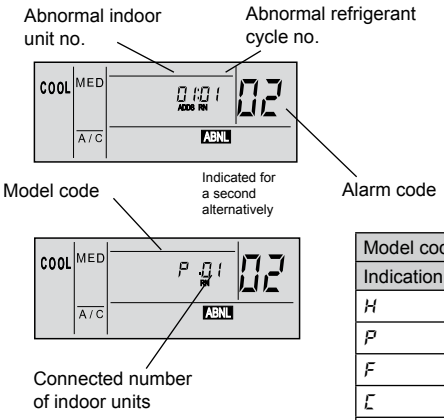
7.2.1. Alarm code

If the RUN LED flickers for 2 seconds, there is a failure in the transmission between the indoor unit and the remote control switch.

Possible causes are:
- Broken remote cable
- Contact failure in the remote control cable
- Defective IC or defective microcomputer

In any case, ask your retailer for service

If the RUN LED flickers 5 times (5 seconds) with the unit number and the alarm code displayed, make a note of the alarm code (refer to the table below) and ask your retailer for service.



Model code	
Indication	Model
H	Heat pump
P	Inverter
F	Multi
C	Cooling only
E	Others
b	IVX individual operation
L	KPI

- **Alarm code table**

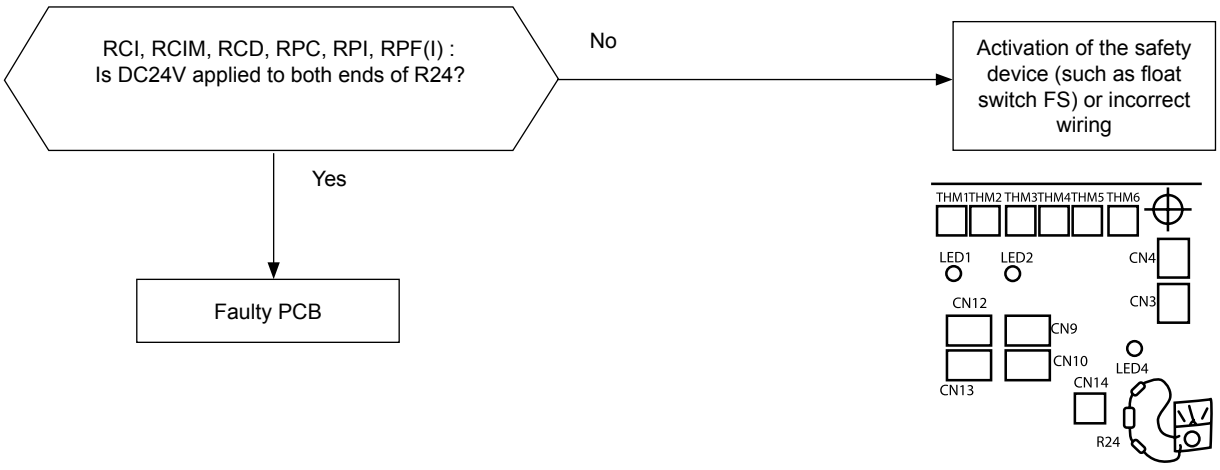
Code No.	Category	Type of Abnormality	Main Cause
01	Indoor unit	Activation of protection device	Float switch activated.
02	Rasc Unit	Activation of protection device	Activation of PSH, locked motor, abnormal operation in the power supply phase, Float Switch Activation in Rasc Unit.
03	Transmission	Abnormality between indoor (or Rasc Unit) and Rasc Unit (or indoor) units	Incorrect wiring. Failure of PCB. Tripping of fuse. Power supply OFF.
04		Abnormal operation between inverter and control PCB	Transmission failure between inverter PCBs.
05	Power source	Abnormality of power source wiring	Incorrect Wiring.
06	Voltage drop	Voltage drop due to excessively low or high voltage in Rasc Unit	Voltage drop in power supply. Incorrect wiring or insufficient capacity of power supply wiring.
07	Cycle	Drop in discharge gas overheating	Excessive refrigerant charge. Expansion valve lock open.
08		Increase in discharge gas temperature	Insufficient refrigerant charge, refrigerant leakage. Expansion valve closed or clogged.
11	Sensor in indoor unit	Inlet air thermistor	Failure of thermistor, sensor, connection
12		Outlet air thermistor	
13		Anti-freeze thermistor	
14		Gas pipe thermistor	
19		Protection device for fan motor is triggered	Failure of fan motor.
20	Sensor of Rasc Unit.	Compressor thermistor	Failure of thermistor, sensor, connection.
22		Outside air thermistor	
24		Evaporation thermistor	
31	System	Incorrect setting of Rasc Unit and indoor unit	Incorrect setting of capacity code
35		Incorrect setting of indoor unit number	Duplication of indoor unit number.
38		RASC Unit circuit protection abnormality	Failure of indoor unit PCB; incorrect wiring; connection to indoor unit PCB.

Code No.	Category	Type of Abnormality	Main Cause
41	Pressure	Overload cooling (possible activation of high pressure device)	RASC unit pipe thermistor temp. is higher than 55ºC and the compressor top temp. is higher than 95ºC, outdoor unit protection device is activated.
42		Heating overload (high-pressure device may be activated)	If I.U. freeze protection thermistor temp. is higher than 55ºC and compressor top temp. is higher than 95ºC, outdoor unit protection device is activated.
47		Enabling of protection device for low pressure drop	Stoppage due to excessive decrease of evaporating temperature (Tem < -35ºC) is activated 3 times in one hour, motor locked in heating operation.
48	Inverter	Activation of overcurrent protection	Clogging of heat exchanger. Locked compressor. Excessive refrigerant charge, Failure of Inverter PCB.
51		Abnormality in inverter current sensor	Failure of Control PCB or Inverter PCB.
53		Activation for protection of Inverter	Inverter PCB Abnormality Compressor failure, heat exchanger clogged.
54		Increase in inverter fin temperature	Abnormal inverter fin thermistor Heat exchanger clogged. Abnormal Rasc Unit fan. Failure of Fan Motor.
55		Inverter Abnormality	Failure of Inverter PCB.
59	Inverter	Abnormal inverter fin thermistor (for the temperature of inverter fin)	Loose connector, short-circuit in disconnected cable
b1	Indoor unit No. setting	Incorrect unit No. setting	Over 64 indoor units, setting by refrigerant cycle No. or indoor unit address.
EE	Compressor	Compressor protection alarm	Compressor failure.

7.2.2. Troubleshooting by alarm code

Alarm code	Description
01	**Activation of the safety device in the indoor unit**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the RASC unit PCB.
  – This alarm code is displayed when the contact between #1 and #2 of CN14 is not closed over 120 seconds during the cooling process, the heating process or the fan operation.

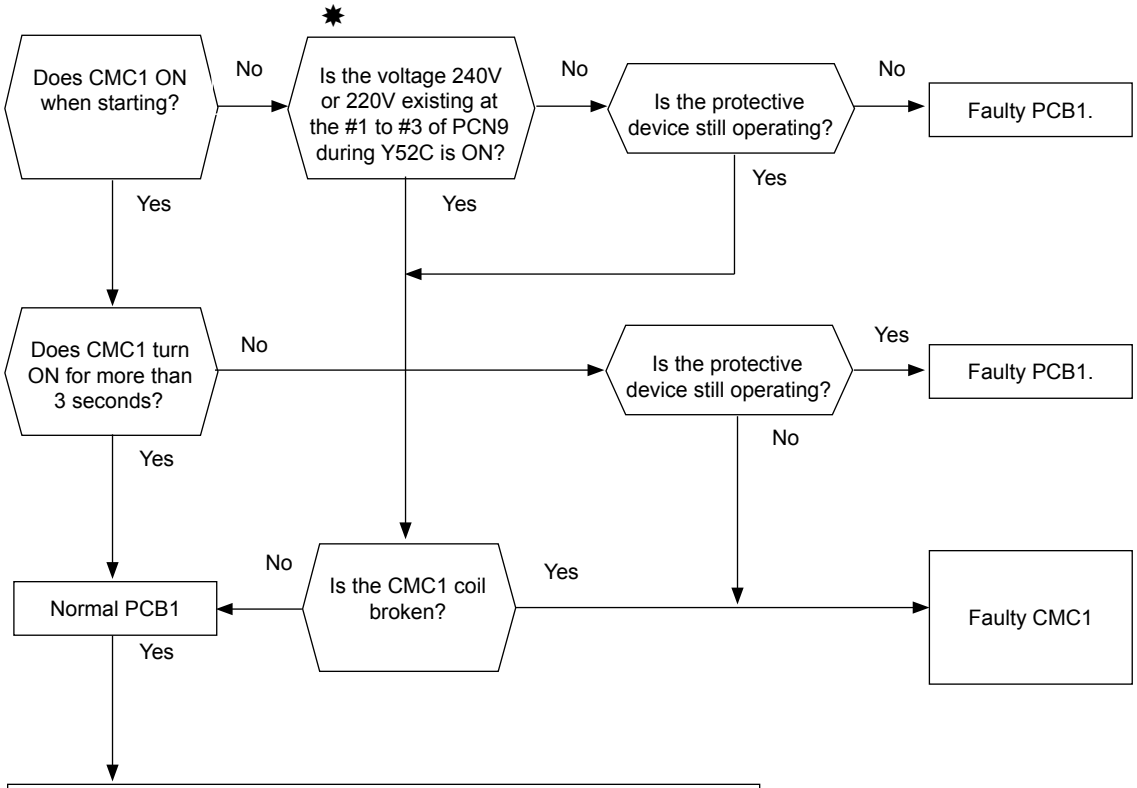


Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Activation of the float switch	High drain level	Clogging of the drainage	Check the drain pump and drain discharge boss	Remove the clogged foreign particles
	Faulty float switch	Fault	Check the continuity when the drain level is low	Replace the float switch if faulty
		Faulty contacting	Measure the resistance using the tester	Fix the looseness and Replace the connector
		Faulty connection	Check the connections	Repair the connection
Faulty indoor unit PCB			Check PCB using the self-check mode *1)	Replace PCB if faulty

*1):Refer to section 7.3.1 and 7.3.3.
Alarm code "01" is not displayed at the RPK series.

Alarm code	Description
02	**Activation of the safety device in the RASC unit**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  – This alarm is indicated when one of safety devices is activated during compressor running.



Check activation of the following safety devices and the power source wiring.
Remove the cause after checking.
(1) High pressure switch
(PSH: 4.15MPa (41.5 kgf/cm²G))
(2) Is the power source line reverse phase or open phase?
If the wiring is incorrect, perform the wiring correctly again.

✸ Check item

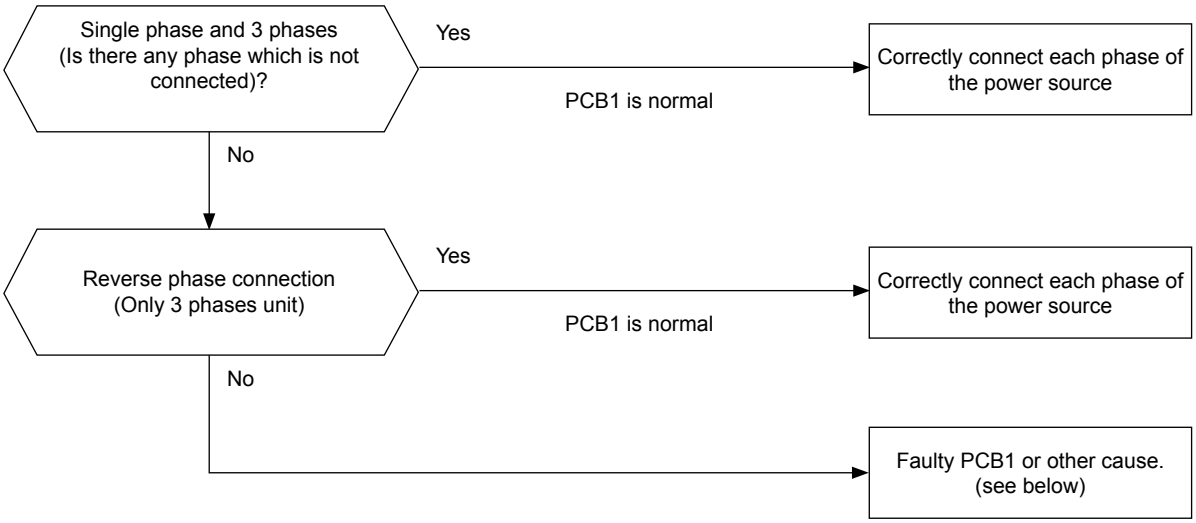
Connector No.	Pin No.
PCN9	#1 to #3

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Activation of the high-pressure switch due to the excessively high discharge pressure	Insufficient air flow to the heat exchanger (Outdoor heat exchanger during the cooling process or indoor heat exchanger during the heating process)		Check the heat exchanger for dust or for clogging	Remove the dust or the clogging
			Check the air filter for dust	Remove the dust
			Check for any obstacles at the inlet or the outlet of the heat exchanger	Remove the obstacles
			Check the service area	Secure service area
			Check the speed (Outdoor fan: cooling / indoor fan: heating)	Replace the fan motor if faulty
	Malfunction of the expansion valve		Disconnected of the connector	Fix the looseness or reconnect the connector
			Fully closed and locked	Replace the expansion valve
	Excessively high temp. air to the indoor unit		Calculate the heat load	Reduce the heat load or use a bigger unit
			Check for hot air near the ceiling (heating)	Provide good circulation
			Check for short-circuited air (heating)	Remove the short-circuited air
			Check for other Rasc Unit	Remove the Rasc Unit
	Faulty high-pressure switch	Faulty pressure switch	Measure the discharge pressure. Check the continuity after the decrease of the pressure	Replace the pressure switch if faulty
		Insufficient contacting	Measure the resistance using the tester	Fix the looseness. Replace the connector
		Incorrect connection	Check the connections	Repair the connections

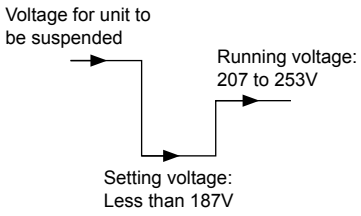
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Activation of the high-pressure switch due to the excessively high discharge pressure	Faulty or malfunction of the expansion valve	Check for clogging	Remove the clogging
		Check the connect wiring and the connectors	Replace the connector
		Check the operation sound from the coil	Replace the coil
		Check the discharge gas thermistor	Replace the thermistor
		Check the attaching state of the discharge gas thermistor	Reattach the thermistor
	Faulty gas bypass solenoid valve	Check for clogging	Replace the gas bypass solenoid valve
	Overcharged refrigerant	Check the cycle operation temp.	Charge the refrigerant correctly
	Mixture of the non-condensate gas in the refrigerant cycle	Check the air temp. and the pressure	Recharge the refrigerant after the vacuum pumping
	Clogging of the discharge piping	Check for clogging	Remove the clogging
	Liquid line stop valve or gas line stop valve is not in operation	Check the stop valves	Fully open the stop valves
	Clogging of the check valve	Check for clogging	Replace the check valve

Alarm code	Description
02	**Abnormal operation of picking up phase signal**

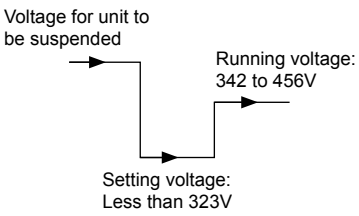
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the RASC unit PCB.
  – This alarm is displayed when the main power source phase is reversely connected or one phase is not connected.



- **RASC-(3/5)HVRNE**



- **RASC-10HRNE**



Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Activation of reverse phase sensor in the RASC unit	Reverse or single phase	Check it according to the electrical wiring	Replacing wires, repair, tightening screws or correct wiring
	Faulty RASC unit PCB	–	Replace PCB if faulty

Alarm code	Description
03	**Abnormal transmission between the indoor units and the outdoor unit**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - This alarm is displayed when an abnormal operation is maintained for three minutes after the normal transmission between the indoor units and the outdoor unit. Also, an abnormal operation is maintained for 30 seconds after the micro-computer is automatically reset.
    The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the outdoor unit.
  - Investigate the cause of the overcurrent and take the necessary action when the fuses are blown out or the breaker for the outdoor unit is activated.

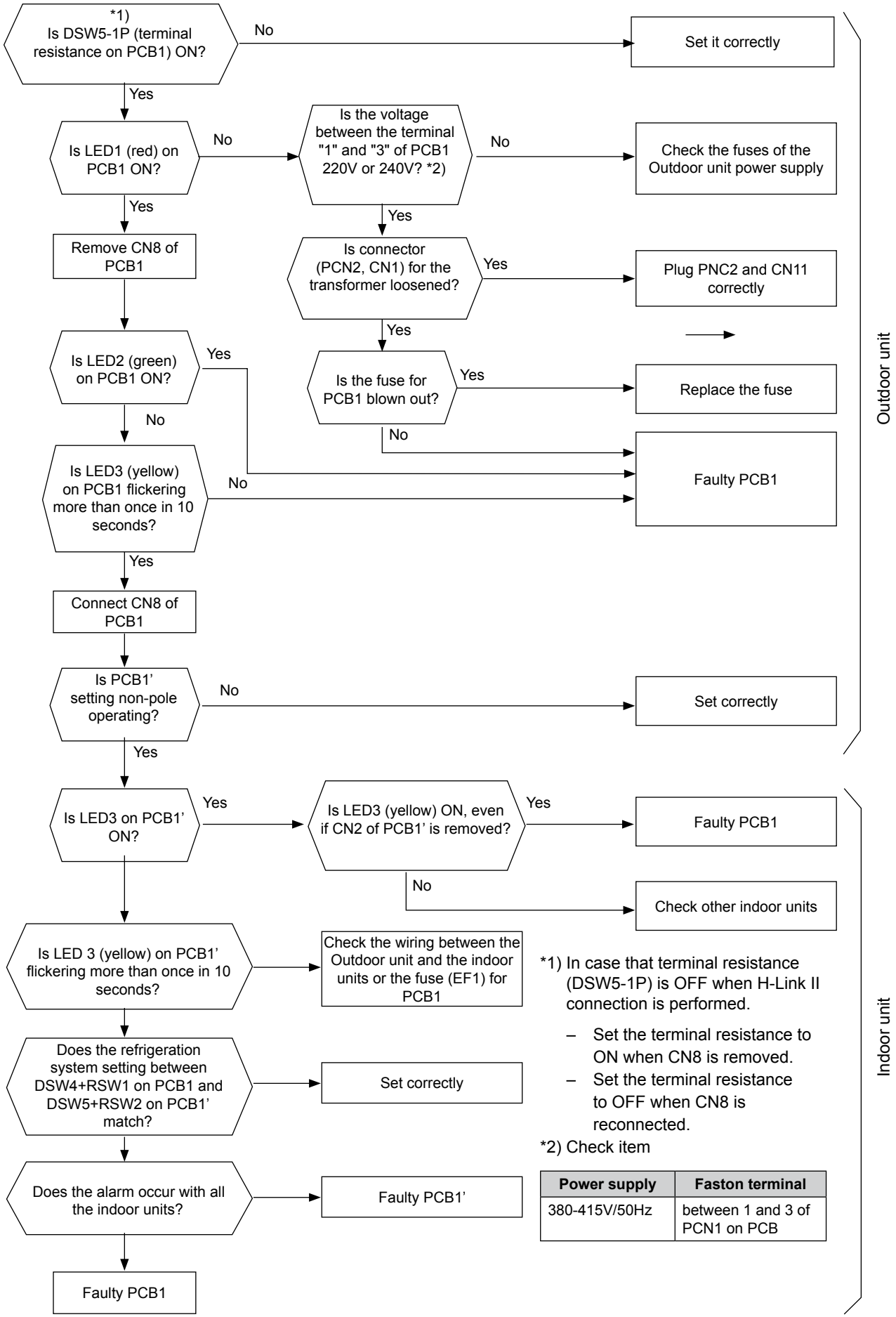
(Refer to the next page)

Note from next page:

*1) In case that terminal resistance (DSW5-1P) is OFF when H-Link connection is performed.
  - Set the terminal resistance to ON when CN8 is removed.
  - Set the terminal resistance to OFF when CN8 is reconnected.

✸ Check item

Power supply	Faston terminal
380-415V/50Hz	between 1 and 3 of PCN1 on PCB


*1)
Is DSW5-1P (terminal resistance on PCB1) ON?
No
Set it correctly
Yes
Is LED1 (red) on PCB1 ON?
No
Is the voltage between the terminal "1" and "3" of PCB1 220V or 240V? *2)
No
Check the fuses of the Outdoor unit power supply
Yes
Yes
Remove CN8 of PCB1
Is connector (PCN2, CN1) for the transformer loosened?
Yes
Plug PNC2 and CN11 correctly
Yes
Is LED2 (green) on PCB1 ON?
Yes
Is the fuse for PCB1 blown out?
Yes
Replace the fuse
No
No
Is LED3 (yellow) on PCB1 flickering more than once in 10 seconds?
No
Faulty PCB1
Yes
Connect CN8 of PCB1
Is PCB1' setting non-pole operating?
No
Set correctly
Yes
Is LED3 on PCB1' ON?
Yes
Is LED3 (yellow) ON, even if CN2 of PCB1' is removed?
Yes
Faulty PCB1
No
Check other indoor units
Is LED 3 (yellow) on PCB1' flickering more than once in 10 seconds?
Check the wiring between the Outdoor unit and the indoor units or the fuse (EF1) for PCB1
Does the refrigeration system setting between DSW4+RSW1 on PCB1 and DSW5+RSW2 on PCB1' match?
Set correctly
Does the alarm occur with all the indoor units?
Faulty PCB1'
Faulty PCB1
Outdoor unit
Indoor unit

*1) In case that terminal resistance (DSW5-1P) is OFF when H-Link II connection is performed.

- Set the terminal resistance to ON when CN8 is removed.
- Set the terminal resistance to OFF when CN8 is reconnected.

*2) Check item

Power supply	Faston terminal
380-415V/50Hz	between 1 and 3 of PCN1 on PCB

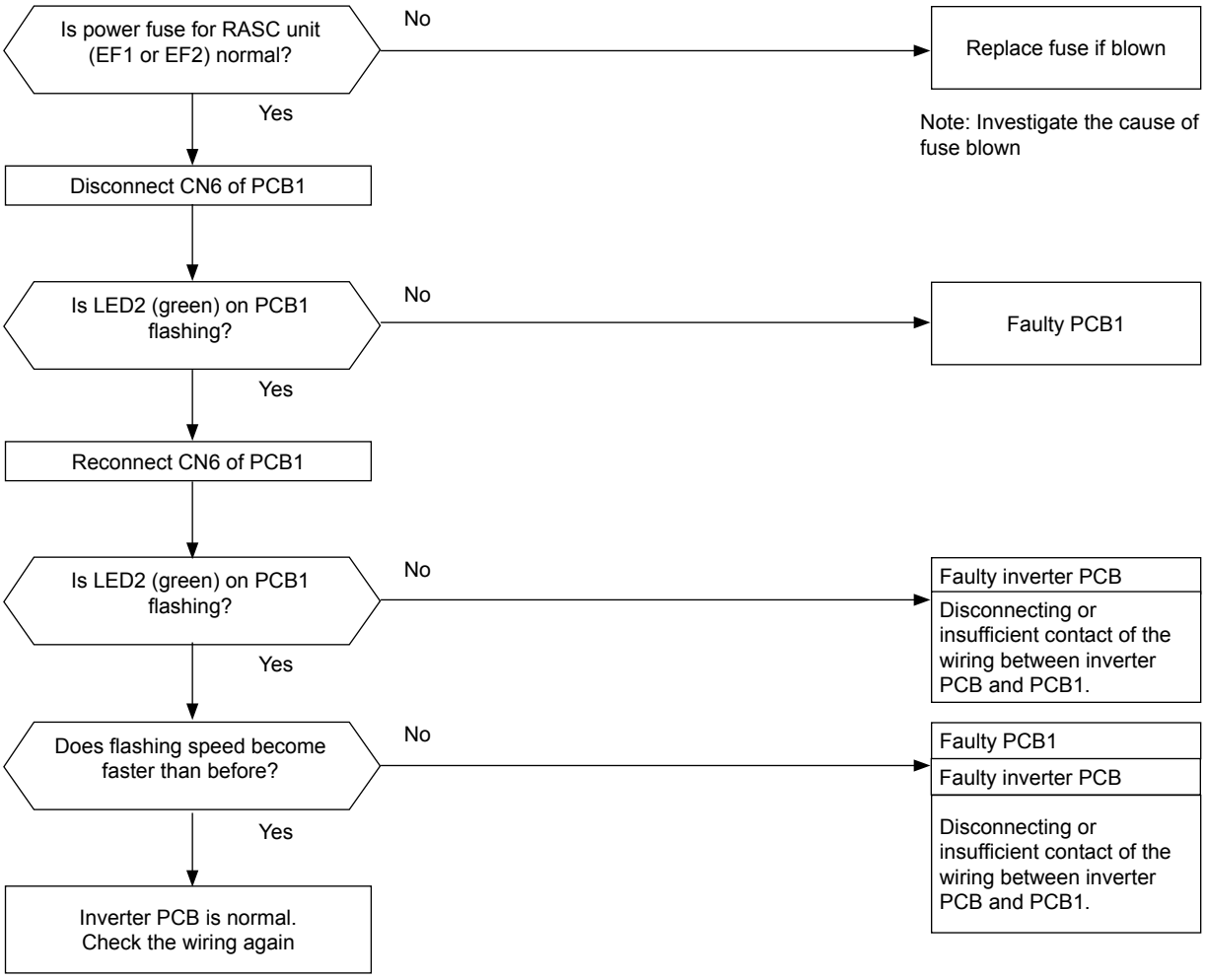
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or no power supply		Measure the voltage using the tester	Supply the power
Blown out fuse for the power source or activation of the outdoor unit breaker	Short circuit between wires	Check the insulation material for breaks	Remove the short circuit and replace the fuse
	Short-circuited wire to ground	Measure the insulation resistance	Remove the short circuit to ground and replace the fuse
	Faulty comp. motor	Measure the resistance between the wires and the insulation resistance	Replace the comp. and the fuse
	Faulty outdoor unit fan motor	Measure the resistance between the wires and the insulation resistance	Replace the outdoor unit fan motor and the fuse
Blown out fuse for control circuit or activation of outdoor unit breaker	Short circuit between wires	Check the insulation material for breaks	Remove the short circuit and replace the fuse
	Short circuit of the control circuit (to ground)	Measure the insulation resistance	Remove the short circuit and replace the fuse
	Faulty solenoid coil for the magnetic switch for the comp. motor	Measure the resistance of coil	Replace the magnetic switch and the fuse
	Failure of the outdoor unit fan motor	Measure the resistance between the wires and the insulation resistance	Replace the outdoor unit fan motor and fuse
Faulty transformer		Measure input voltage	Replace transformer
Disconnected wires insufficient contacting or incorrect connection	Between outdoor unit and indoor unit	Check the continuity of the wires. Check for looseness of the connection screws. Check the terminal nos.	Replacing wires repairing and tightening the screws and the correct wiring
	Power source wiring for the outdoor unit		
Faulty PCB (Outdoor unit, indoor unit)	Disconnected wires to PCB	Check the connections	Correctly connect the wires
	Faulty PCB	-	Replace PCB if faulty
Incorrect wiring	Disconnected wire; insufficient contacting	Check the continuity and the looseness of connection screws	Replacing wires, repairing and tightening the screws
	Incorrect wiring	Check the terminal Nos.	Correctly connect the wires

*1)

PCB1 output voltage	Voltage
Vcc 12 - GND2	12VDC
Vcc 05 - GND1	5 VDC
Vcc 15 - GND1	15 VDC
Vcc 24 - GND1	24 VDC
Vcc 12T - GND1	12 VDC

Alarm code	Description
04	**Abnormal transmission between Inverter PCB and RASC unit PCB1**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the RASC unit PCB.
  - This alarm is displayed when the abnormal operation is maintained for 30 seconds after the normal transmission between the RASC unit PCB1 and inverter PCB. Also, the abnormal operation is maintained for 30 seconds after the micro-computer is automatically reset. The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the RASC unit.


Is power fuse for RASC unit (EF1 or EF2) normal?
No
Replace fuse if blown
Note: Investigate the cause of fuse blown
Yes
Disconnect CN6 of PCB1
Is LED2 (green) on PCB1 flashing?
No
Faulty PCB1
Yes
Reconnect CN6 of PCB1
Is LED2 (green) on PCB1 flashing?
No
Faulty inverter PCB
Disconnecting or insufficient contact of the wiring between inverter PCB and PCB1.
Yes
Does flashing speed become faster than before?
No
Faulty PCB1
Faulty inverter PCB
Disconnecting or insufficient contact of the wiring between inverter PCB and PCB1.
Yes
Inverter PCB is normal. Check the wiring again

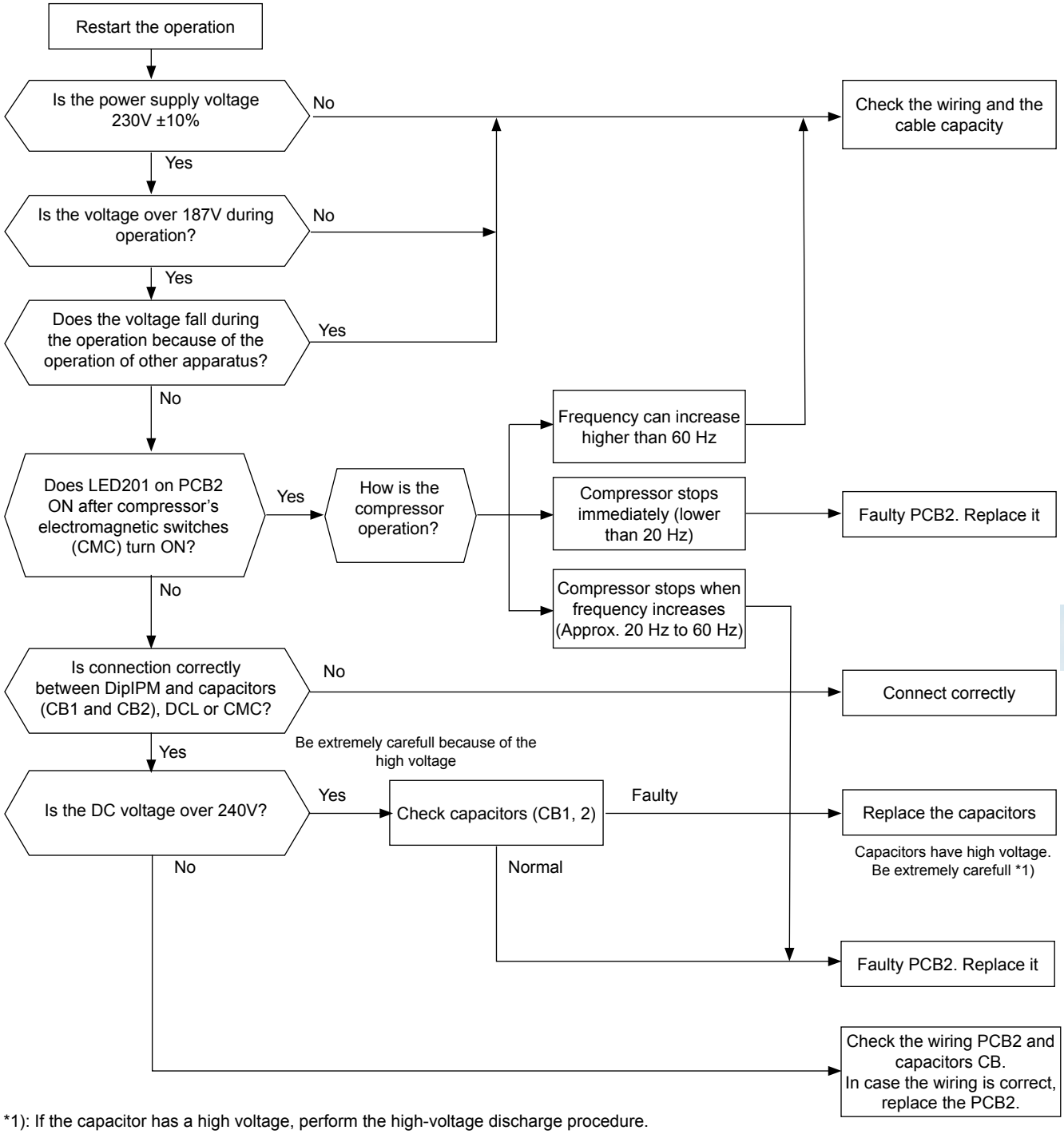
PCB1: Control PCB in RASC unit
Inverter dipIPM RASC-(3/5)HVRNE
Inverter IPM RASC-10HRNE

7

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Disconnected wires, insufficient contacting or incorrect connection	Between control PCB, inverter PCB and FANM	Check the continuity of wires. Check for looseness of the connection screws. Check the connection No.	Replacing wires, repairing, tightening screws and incorrect wiring
	Power source wiring for the RASC unit		
Faulty PCB (PCB1 for the control, PCB for the inverter)	Disconnected wires to PCB	Check the connections	Repair the wiring connections
	Faulty PCB		Replace PCB if faulty
Incorrect wiring	Disconnected wires; insufficient contacting	Check the continuity. Check for looseness of connection screws	Replacing wires, repairing, tightening screws
	Incorrect wiring	Check the connection nos.	Correctly connect the wires

Alarm code	Description
06	**Excessively low voltage or excessively high voltage for the inverter (RASC-(3/5)HVRNE)**

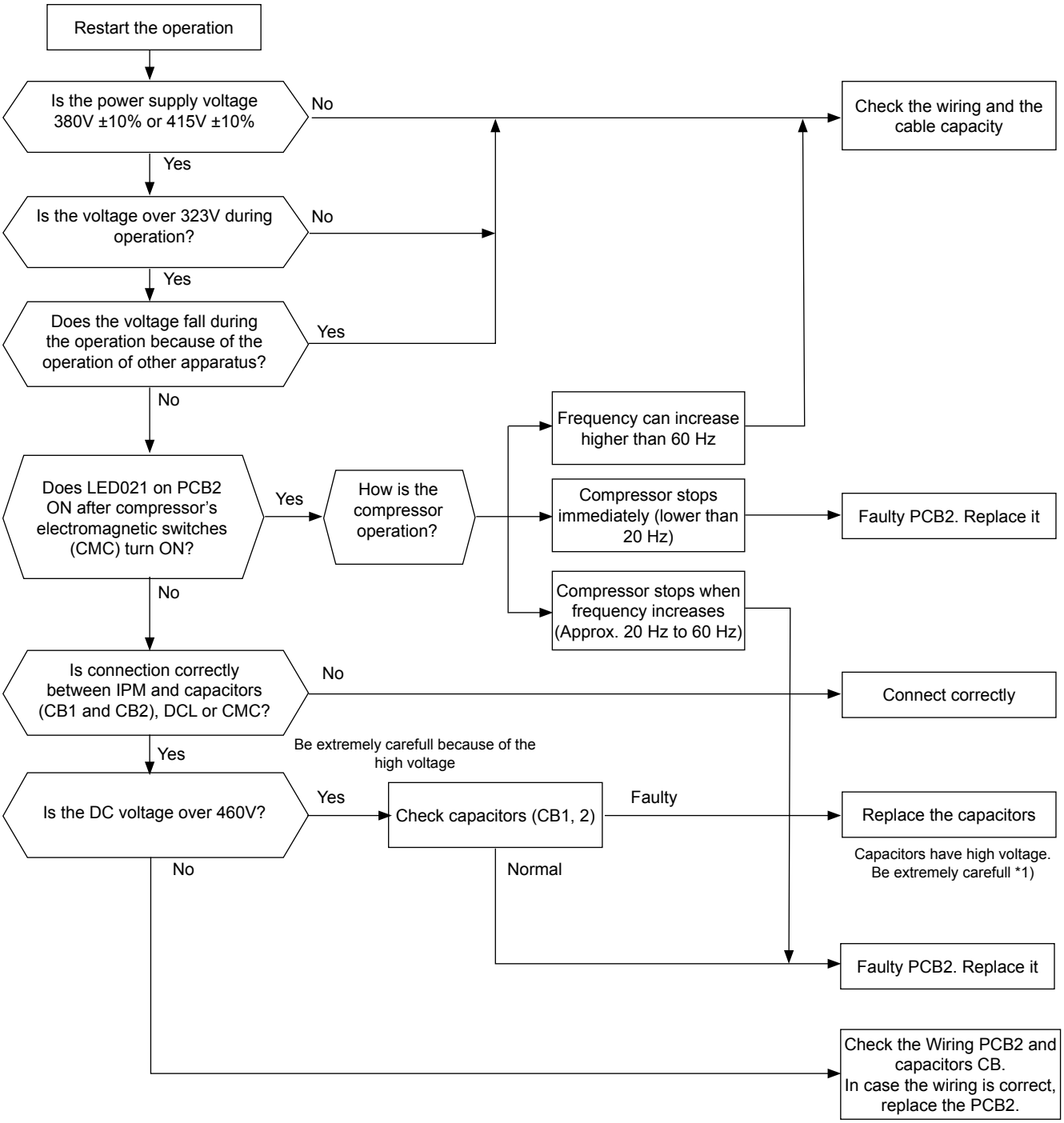
- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the RASC unit PCB.
  - This alarm code is displayed when the voltage between terminal “P” and “N” of Dip IPM is insufficient and the alarm has three occurrences in 30 minutes. If the number of occurrences is smaller than two, the retry operation is performed. The alarm code “06” means fan controller Abnormal Operation.


Restart the operation
Is the power supply voltage 230V ±10%
No
Check the wiring and the cable capacity
Yes
Is the voltage over 187V during operation?
No
Yes
Does the voltage fall during the operation because of the operation of other apparatus?
Yes
No
Does LED201 on PCB2 ON after compressor’s electromagnetic switches (CMC) turn ON?
Yes
How is the compressor operation?
Frequency can increase higher than 60 Hz
Compressor stops immediately (lower than 20 Hz)
Faulty PCB2. Replace it
Compressor stops when frequency increases (Approx. 20 Hz to 60 Hz)
No
Is connection correctly between DipIPM and capacitors (CB1 and CB2), DCL or CMC?
No
Connect correctly
Yes
Be extremely carefull because of the high voltage
Is the DC voltage over 240V?
Yes
Check capacitors (CB1, 2)
Faulty
Replace the capacitors
Capacitors have high voltage. Be extremely carefull *1)
No
Normal
Faulty PCB2. Replace it
Check the wiring PCB2 and capacitors CB. In case the wiring is correct, replace the PCB2.

*1): If the capacitor has a high voltage, perform the high-voltage discharge procedure. Refer to section 7.3.4.
*2): Checking procedures of the diode module are displayed in item 7.3.4.

Alarm code	Description
06	**Excessively low voltage or excessively high voltage for the inverter (RASC-10HRNE)**

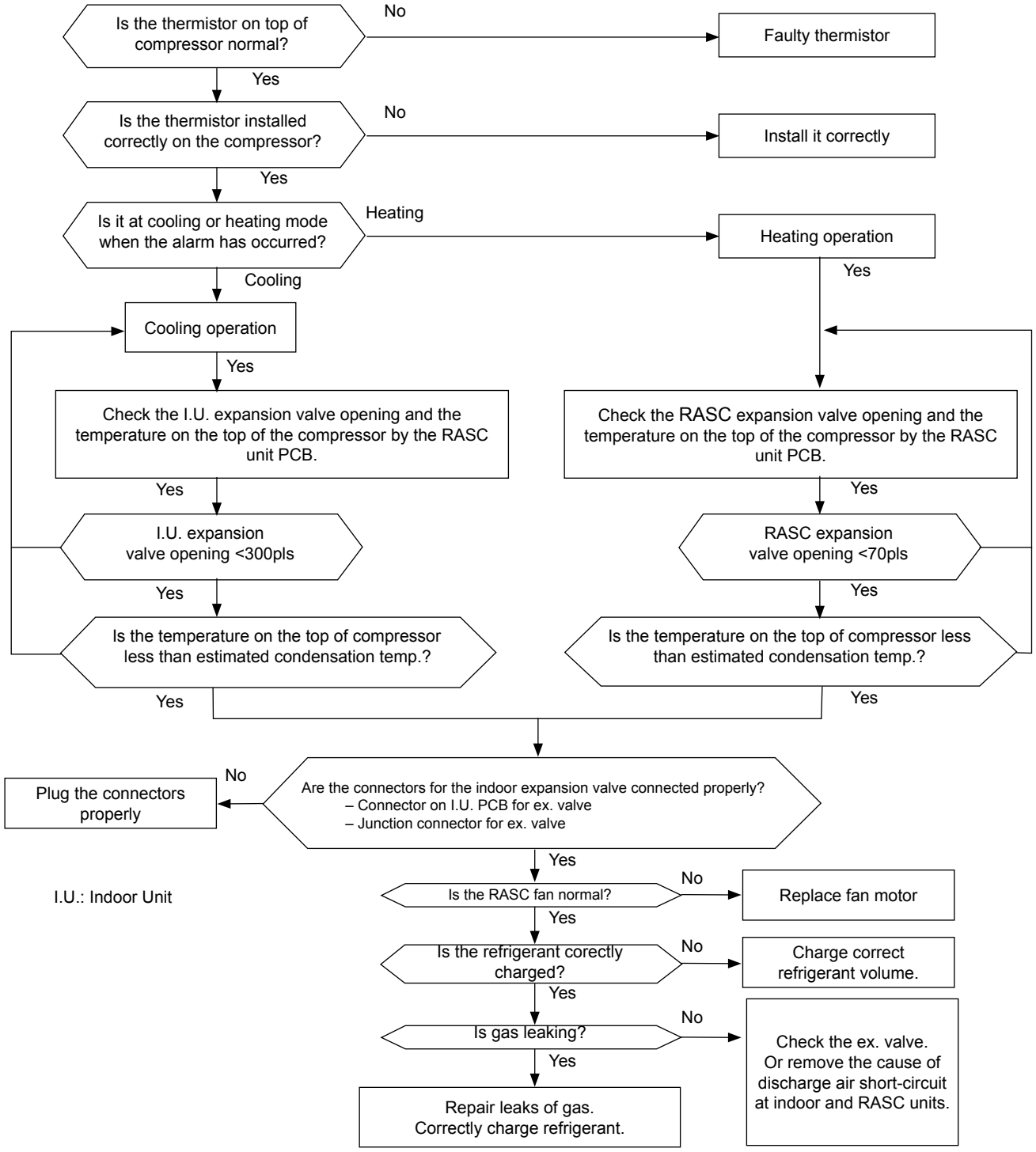
- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the Outdoor unit PCB.
  - This alarm code is displayed when the voltage between terminal “P” and “N” of IPM is insufficient and the alarm has three occurrences in 30 minutes. If the number of occurrences is smaller than two, the retry operation is performed. The alarm code “06.” means fan controller abnormal operation.


Restart the operation
Is the power supply voltage 380V ±10% or 415V ±10%
No
Check the wiring and the cable capacity
Yes
Is the voltage over 323V during operation?
No
Yes
Does the voltage fall during the operation because of the operation of other apparatus?
Yes
No
Does LED021 on PCB2 ON after compressor’s electromagnetic switches (CMC) turn ON?
Yes
How is the compressor operation?
Frequency can increase higher than 60 Hz
Compressor stops immediately (lower than 20 Hz)
Faulty PCB2. Replace it
Compressor stops when frequency increases (Approx. 20 Hz to 60 Hz)
No
Is connection correctly between IPM and capacitors (CB1 and CB2), DCL or CMC?
No
Connect correctly
Yes
Be extremely carefull because of the high voltage
Is the DC voltage over 460V?
Yes
Check capacitors (CB1, 2)
Faulty
Replace the capacitors
Capacitors have high voltage. Be extremely carefull *1)
No
Normal
Faulty PCB2. Replace it
Check the Wiring PCB2 and capacitors CB. In case the wiring is correct, replace the PCB2.

*1): If the capacitor has a high voltage, perform the high-voltage discharge procedure. Refer to section 7.3.4.
*2): Checking procedures of the diode module are displayed in item 7.3.4.

Alarm code	Description
07	**Decrease of discharge gas superheat**

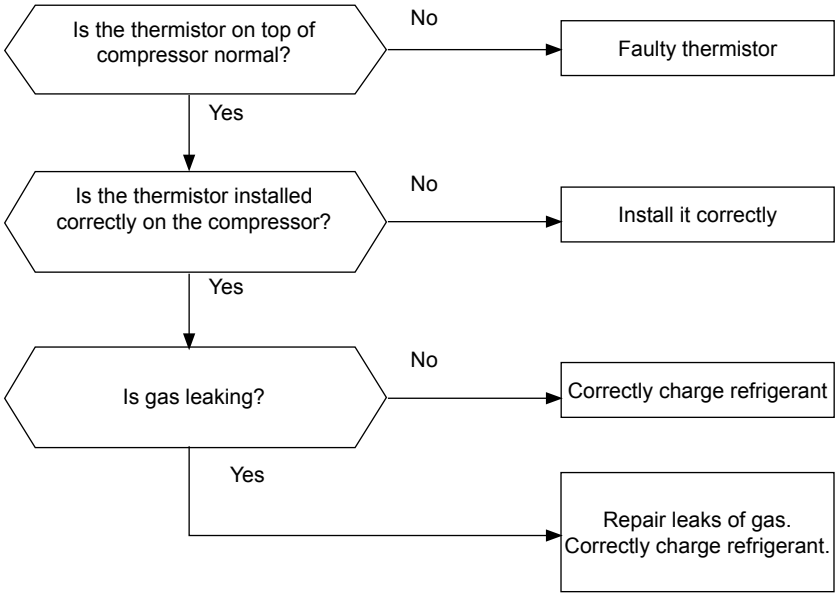
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the RASC unit PCB.
  This alarm code is indicated as follows:
  – The temperature on the top of the compressor is less than the target and also the I.U. expansion valve opening is under 300pls at cooling operation for 30 minutes.
  – The temperature on the top of compressor is less than the target and also the RASC expansion valve opening is under 70pls at heating operation for 30 minutes.
  – The compressor is stopped and then the retry operation is performed after 30 minutes.


Is the thermistor on top of compressor normal?
No
Faulty thermistor
Yes
Is the thermistor installed correctly on the compressor?
No
Install it correctly
Yes
Is it at cooling or heating mode when the alarm has occurred?
Heating
Heating operation
Cooling
Yes
Cooling operation
Yes
Check the I.U. expansion valve opening and the temperature on the top of the compressor by the RASC unit PCB.
Check the RASC expansion valve opening and the temperature on the top of the compressor by the RASC unit PCB.
Yes
Yes
I.U. expansion valve opening <300pls
RASC expansion valve opening <70pls
Yes
Yes
Is the temperature on the top of compressor less than estimated condensation temp.?
Is the temperature on the top of compressor less than estimated condensation temp.?
Yes
Yes
Are the connectors for the indoor expansion valve connected properly?
– Connector on I.U. PCB for ex. valve
– Junction connector for ex. valve
No
Plug the connectors properly
Yes
Is the RASC fan normal?
No
Replace fan motor
Yes
Is the refrigerant corectly charged?
No
Charge correct refrigerant volume.
Yes
Is gas leaking?
No
Check the ex. valve.
Or remove the cause of discharge air short-circuit at indoor and RASC units.
Yes
Repair leaks of gas.
Correctly charge refrigerant.
I.U.: Indoor Unit

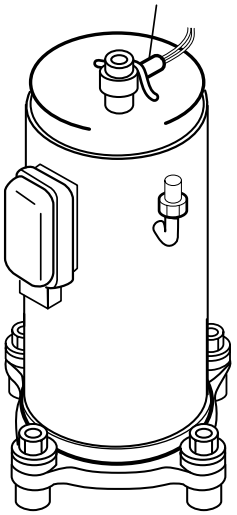
Alarm code	Description
08	**Excessively High Discharge Gas Temperature at the Top of Compressor Chamber**

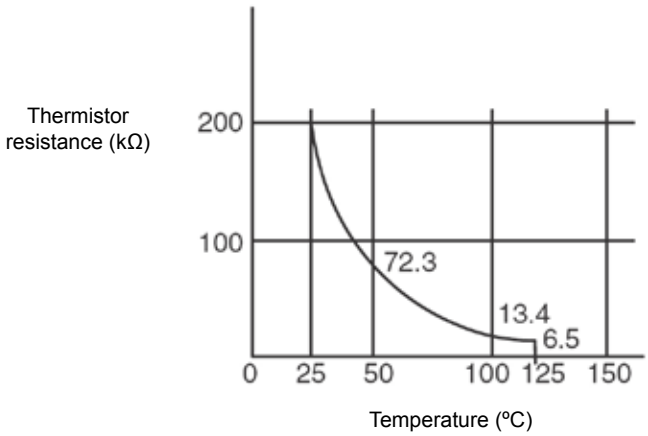
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the Outdoor unit PCB.
  - This alarm is indicated when the temperature of the thermistor on the top of the compressor is maintained higher than 127°C for 10 minutes or higher than 140°C for 5 seconds under cooling operation (1).
  - This alarm is indicated when the temperature of the thermistor on the top of the compressor is maintained higher than 120°C for 10 minutes or higher than 140°C for 5 seconds under heating operation (1)

(1) For RASC-3HVRNE the temperature is 115 ºC and 125 ºC in cooling and heating mode

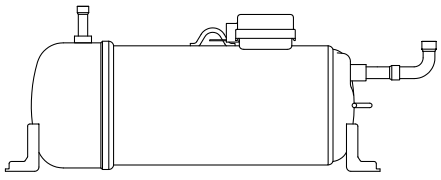


Thermistor for high discharge gas temperature at the top of compressor chamber (THM9)



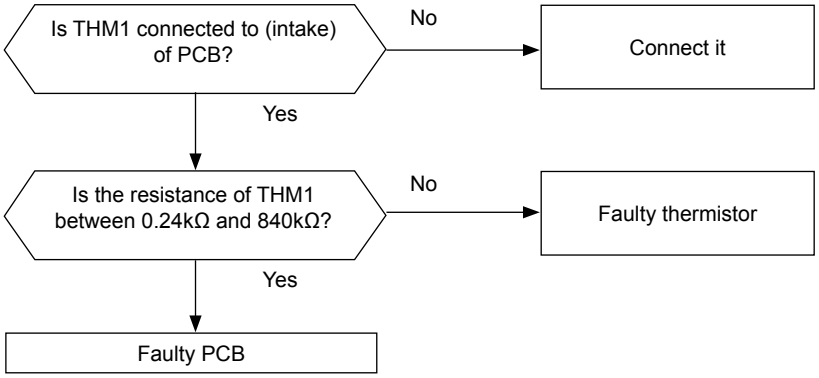


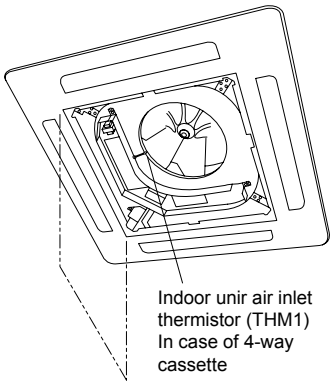
Thermistor resistance characteristics



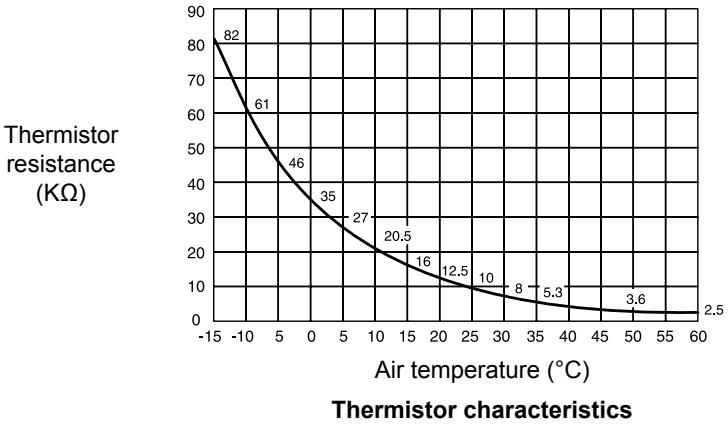
Alarm code	Description
11	**Abnormal operation of thermistor for the indoor unit air inlet temperature (air inlet thermistor)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the Outdoor unit PCB.
  - This alarm code is displayed when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling process or the heating process. The system is automatically restarted when the fault is removed.





Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty air inlet thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and the connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty



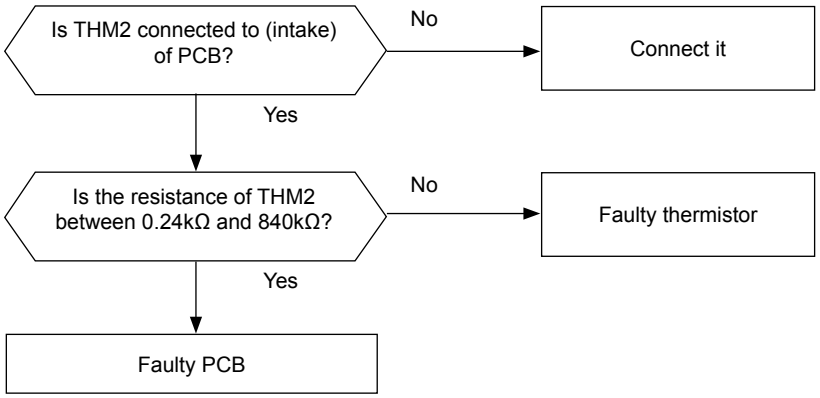
Thermistor characteristics

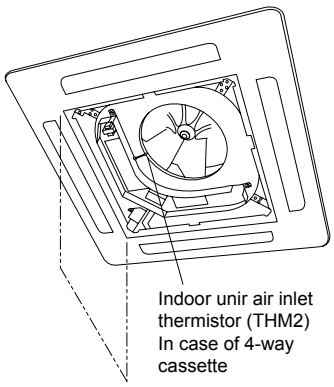
NOTE

- *This data is applicable to the following thermistors:*
- *1. Indoor unit discharge air temperature,*
- *2. Indoor unit liquid refrigerant temperature*
- *3. Indoor unit air inlet temperature*
- *4. Outdoor temperature (Outdoor unit inlet air temperature)*
- *5. Outdoor unit evaporating temperature*
- *6. Indoor unit gas piping*

Alarm code	Description
12	**Abnormal operation of the thermistor for the indoor discharge air temperature (air outlet thermistor)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the Outdoor unit PCB.
  – This alarm code is displayed when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling process or the heating process. The system is automatically restarted when the fault is removed.

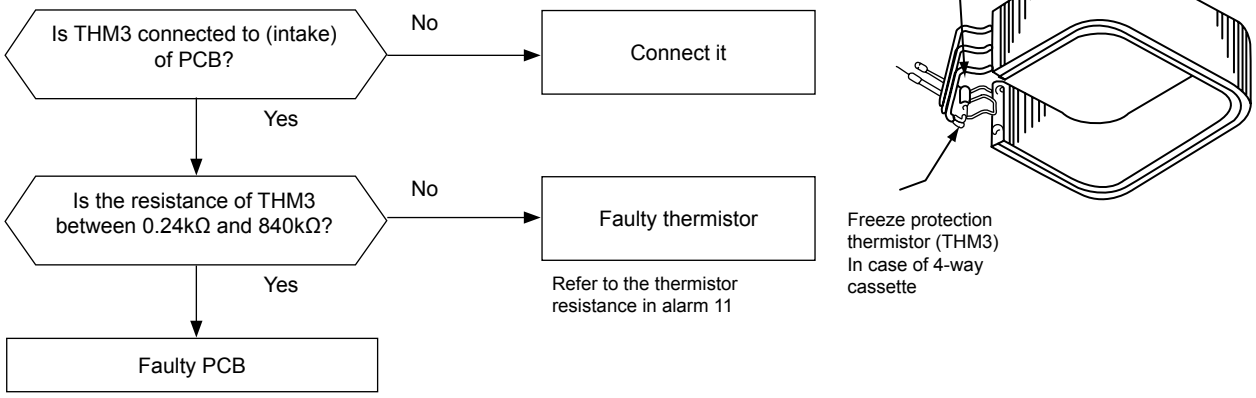




Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty air outlet thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

Alarm code	Description
13	**Abnormal operation of the thermistor for the indoor unit heat exchanger liquid pipe temperature (freeze protection thermistor)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the Outdoor unit PCB.
  - This alarm code is displayed when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling process or the heating process. The system is automatically restarted when the fault is removed.

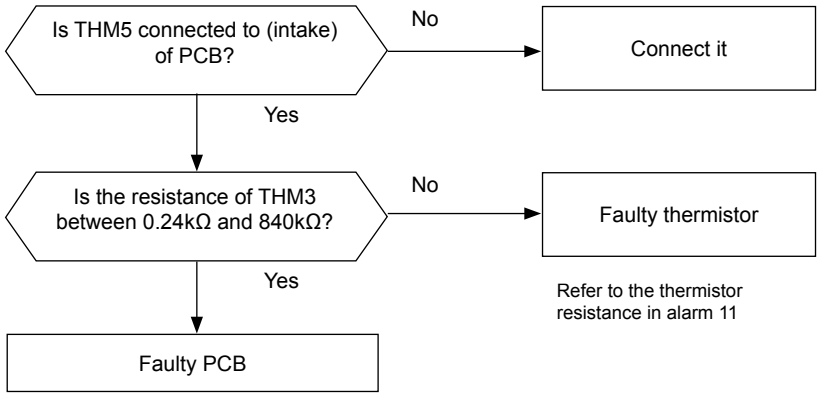


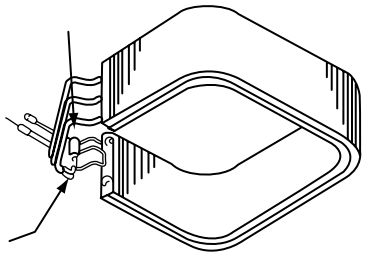
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty freeze protection thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

7

Alarm code	Description
14	**Abnormal operation of the thermistor for the indoor unit heat exchanger gas pipe temperature (gas piping thermistor)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the Outdoor unit PCB.
  – This alarm code is displayed when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling process or the heating process. The system is automatically restarted when the fault is removed.



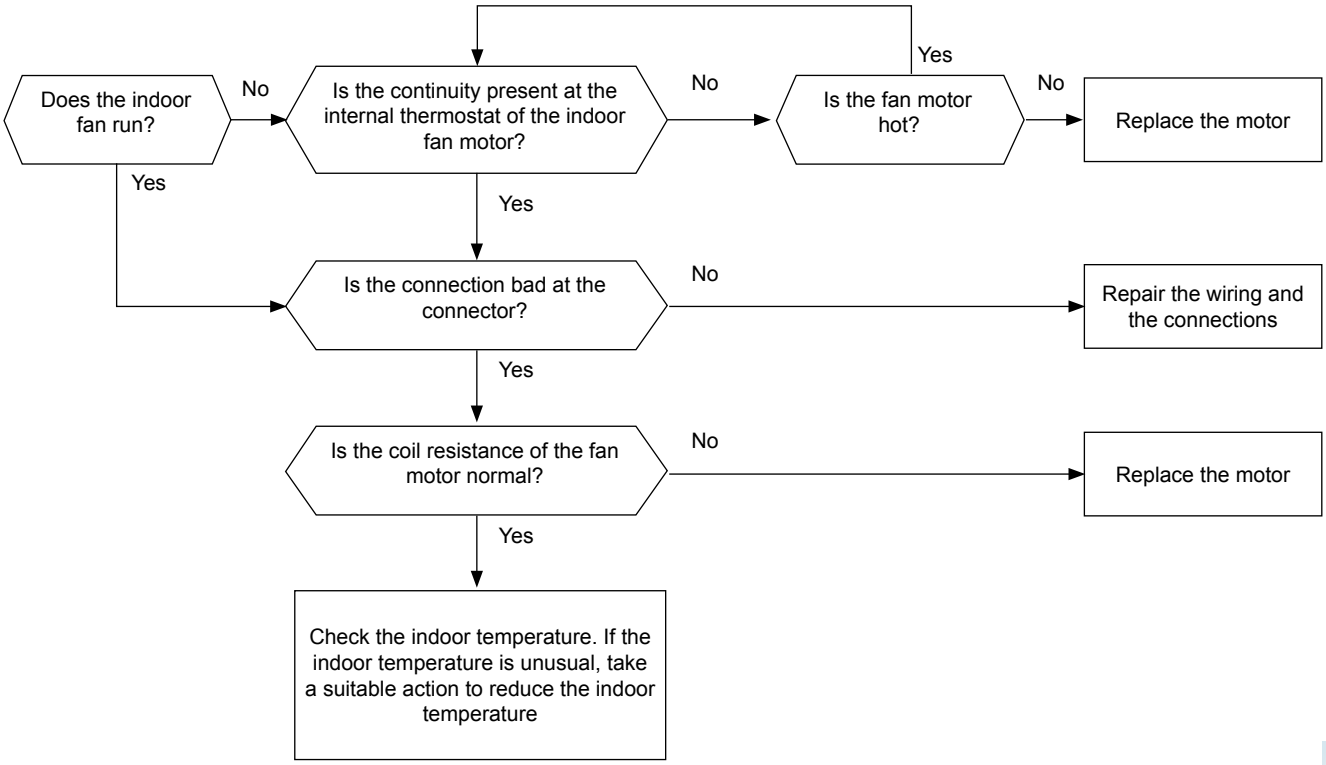


Heat exchanger gas pipe thermistor (THM3)
In case of 4-way cassette

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty gas piping thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

Alarm code	Description
19	**Activation of the protection device for the indoor fan motor (except RCI, RCIM and RPK)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the Outdoor unit PCB.
  – This alarm code is displayed when the temperature of the internal thermostat for the indoor fan motor is higher than 130 °C.

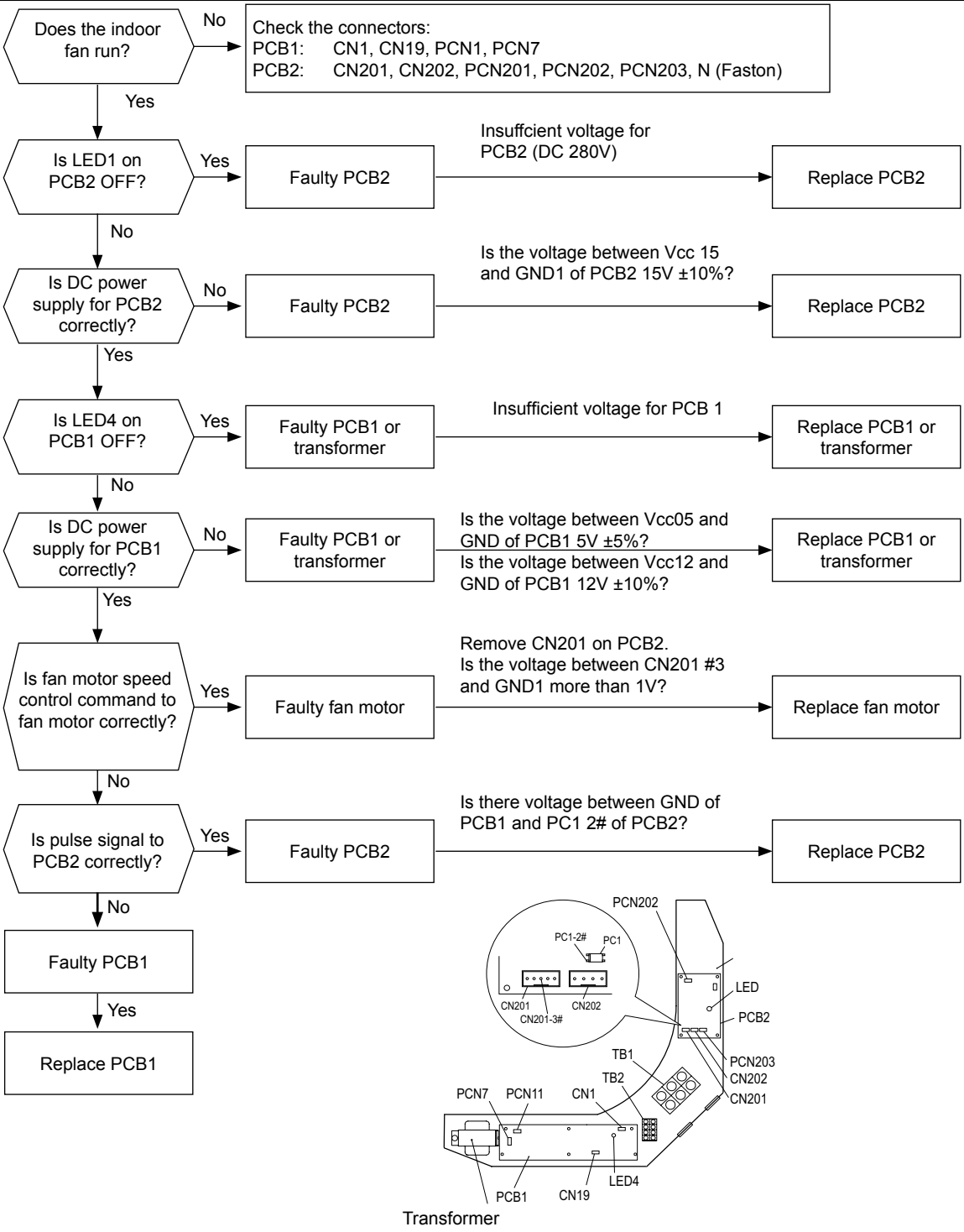

Does the indoor fan run?
No
Is the continuity present at the internal thermostat of the indoor fan motor?
No
Is the fan motor hot?
Yes
No
Replace the motor
Yes
Yes
Is the connection bad at the connector?
No
Repair the wiring and the connections
Yes
Is the coil resistance of the fan motor normal?
No
Replace the motor
Yes
Check the indoor temperature. If the indoor temperature is unusual, take a suitable action to reduce the indoor temperature

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Activation of the internal thermostat for the indoor unit fan motor	Faulty indoor unit fan motor		Measure the coil resistance and the insulation resistance	Replace the motor if faulty
	Faulty internal thermostat	Fault	Check the continuity after the fan motor temperature decreases to room temp	Replace the fan motor if there is no continuity
		Insufficient contacting	Measure the resistance using the tester	Correct looseness. Replace the connectors
		Incorrect connection	Check the connections	Repair the connections

Alarm code	Description
19	**Activation of the protection device for the indoor fan motor (RCI, RCIM)**

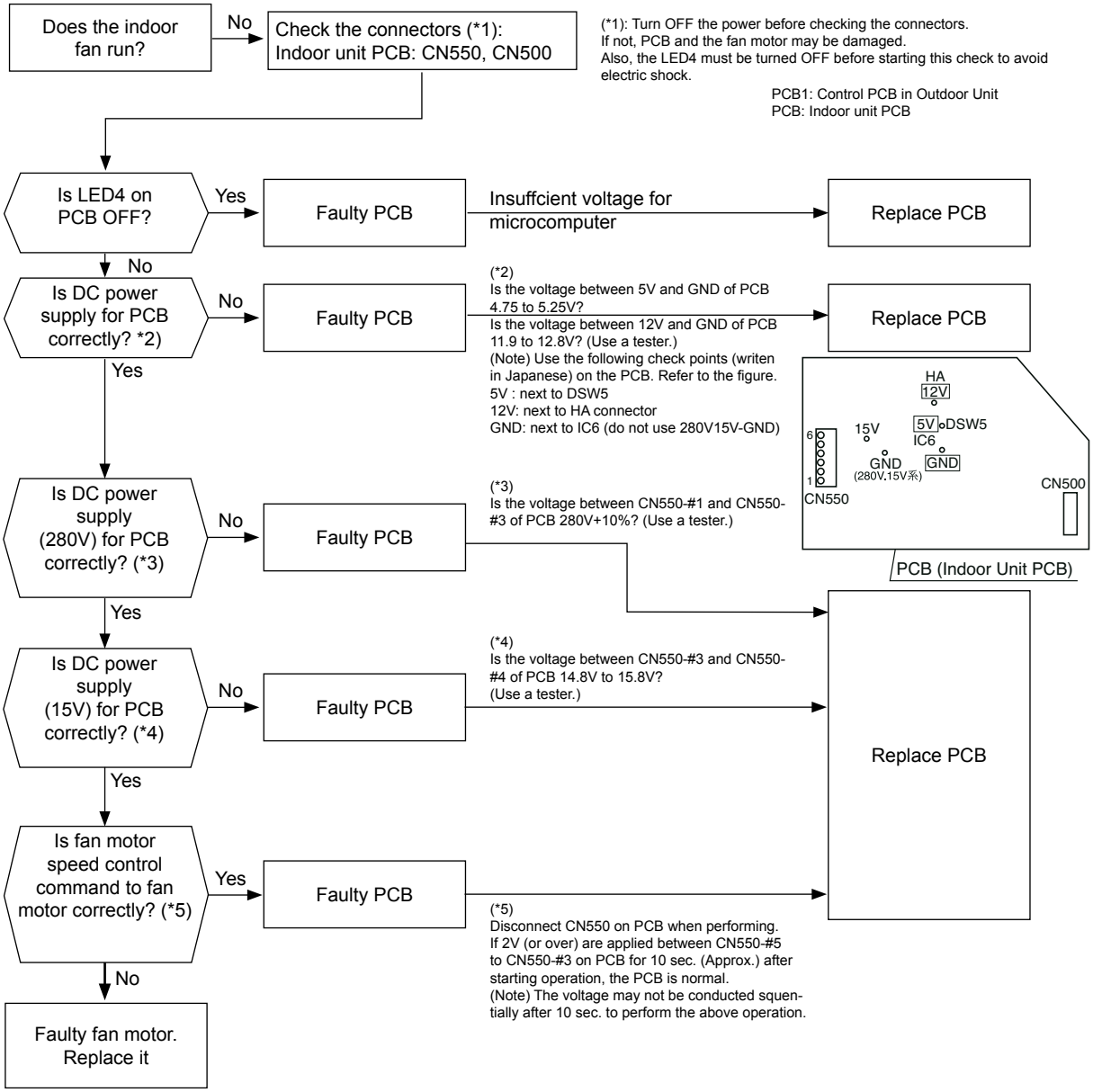
- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. and the alarm code is indicated on the display of the Outdoor unit PCB.
  - This alarm code is indicated when the following condition occurs thre times in 30 minutes: Indoor fan rotates less than 70 rpm for 5 seconds during operation.

When the cause is checked using this flow chart, confirm that fan speed setting is Hi.



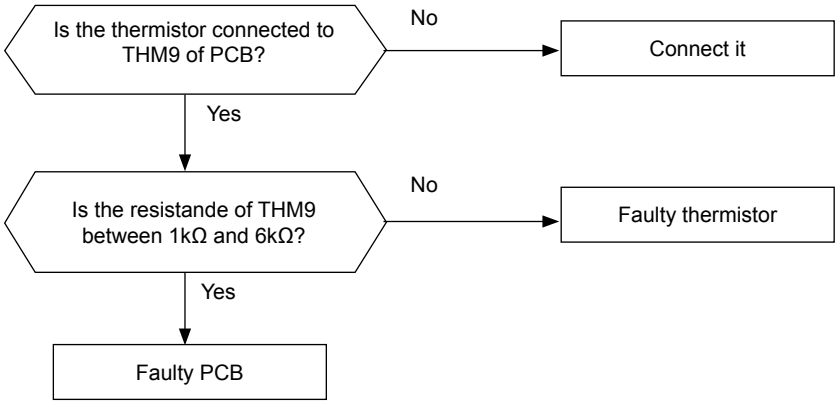
Alarm code	Description
19	**Activation of the protection device for the indoor fan motor (RPK)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm code is displayed when the following conditions occurs three times in 30 minutes.
    Indoor fan rotates less than 70rpm for 5 seconds during operation.
- Set air flow volume “Hi” before starting this check.

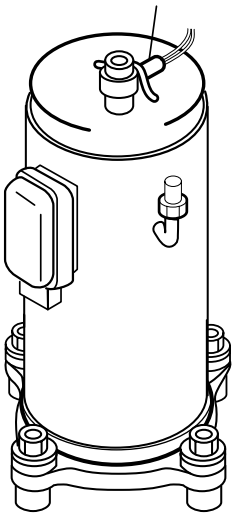

Does the indoor fan run?
No
Check the connectors (*1): Indoor unit PCB: CN550, CN500
(*1): Turn OFF the power before checking the connectors. If not, PCB and the fan motor may be damaged. Also, the LED4 must be turned OFF before starting this check to avoid electric shock.
PCB1: Control PCB in Outdoor Unit
PCB: Indoor unit PCB
Is LED4 on PCB OFF?
Yes
Faulty PCB
Insuffcient voltage for microcomputer
Replace PCB
No
Is DC power supply for PCB correctly? *2)
No
Faulty PCB
(*2) Is the voltage between 5V and GND of PCB 4.75 to 5.25V? Is the voltage between 12V and GND of PCB 11.9 to 12.8V? (Use a tester.) (Note) Use the following check points (writen in Japanese) on the PCB. Refer to the figure. 5V : next to DSW5 12V: next to HA connector GND: next to IC6 (do not use 280V15V-GND)
Replace PCB
HA
12V
5V
DSW5
IC6
15V
GND
GND
(280V,15V系)
6
1
CN550
CN500
PCB (Indoor Unit PCB)
Yes
Is DC power supply (280V) for PCB correctly? (*3)
No
Faulty PCB
(*3) Is the voltage between CN550-#1 and CN550-#3 of PCB 280V+10%? (Use a tester.)
Yes
Is DC power supply (15V) for PCB correctly? (*4)
No
Faulty PCB
(*4) Is the voltage between CN550-#3 and CN550-#4 of PCB 14.8V to 15.8V? (Use a tester.)
Replace PCB
Yes
Is fan motor speed control command to fan motor correctly? (*5)
Yes
Faulty PCB
(*5) Disconnect CN550 on PCB when performing. If 2V (or over) are applied between CN550-#5 to CN550-#3 on PCB for 10 sec. (Approx.) after starting operation, the PCB is normal. (Note) The voltage may not be conducted squentially after 10 sec. to perform the above operation.
No
Faulty fan motor. Replace it

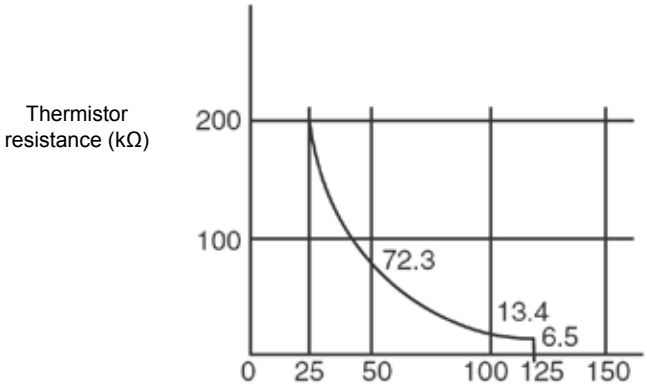
Alarm code	Description
20	**Abnormality of thermistor for discharge gas temperature (compressor thermistor)**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the Outdoor unit PCB.
  – This alarm code is indicated when the thermistor is short-circuited (less than 1 kΩ) or cut (greater than 6 MΩ) during the cooling or heating operation.

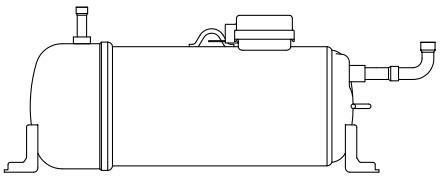


Thermistor onTop of compressor





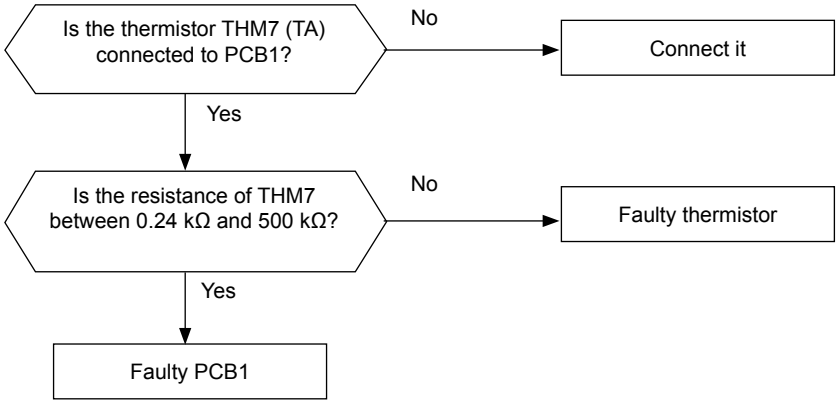
Thermistor resistance characteristics



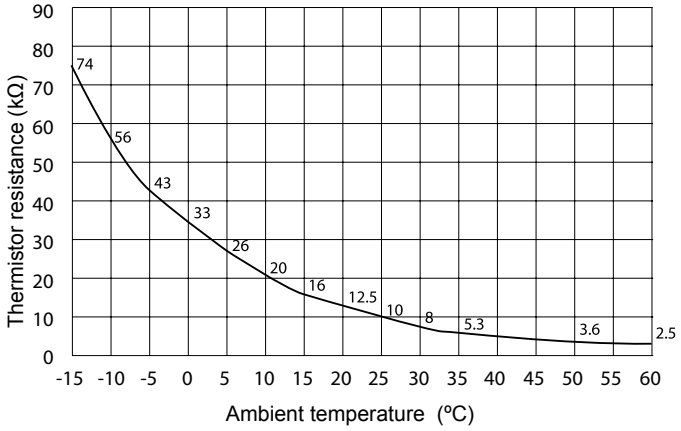
Phenomenon	Cause	Check item	Action (Turn OFF main switch)
Faulty top of compressor thermistor	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB1	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB1 if faulty

Alarm code	Description
22	**Abnormal operation of the inlet air temperature thermistor (RASC unit outdoor ambient thermistor)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the RASC unit PCB.
  – This alarm code is displayed when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 500 kΩ) during the operation. However, this alarm occurs during the test run mode only. In the case that the thermistor is abnormal during the operation, the operation continues based on the assumption that the outdoor temperature is 35 °C (cooling) / 6 °C (heating).



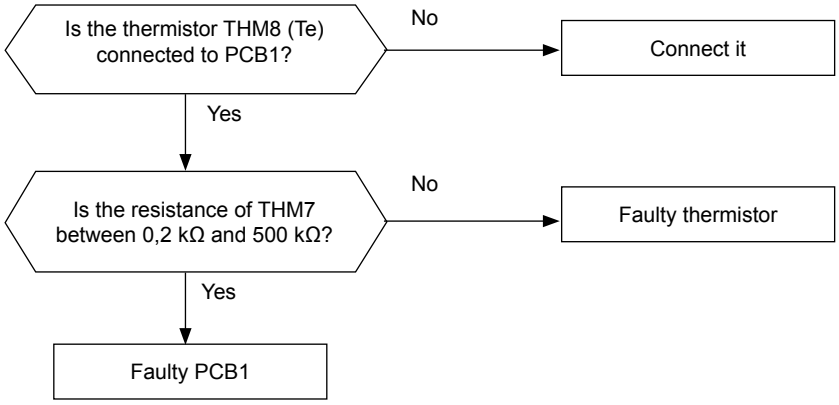
Thermistor characteristics



Phenomenon	Cause	Check item	Action (Turn OFF main switch)
Faulty of the inlet air temperature thermistor (RASC unit outdoor ambient thermistor)	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB if faulty

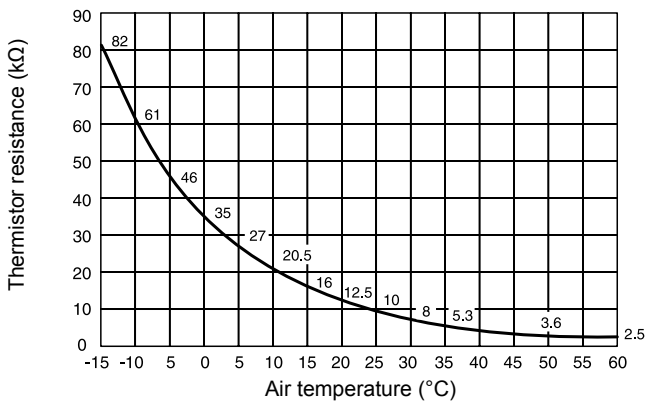
Alarm code	Description
24	**Abnormal operation of the thermistor for the evaporating temperature during the heating process (outdoor unit)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB. (*1)
  If you find an abnormal operation of the thermistor, check all the thermistors as shown below.
  – The evaporating thermistor during the heating process is attached to the heat exchanger as shown in the figure below. If the thermistor is faulty, such as short-circuit (less than 0,2kΩ) or cut (more than 840kΩ) during eight minutes continuously, this alarm is displayed. The position is indicated below.

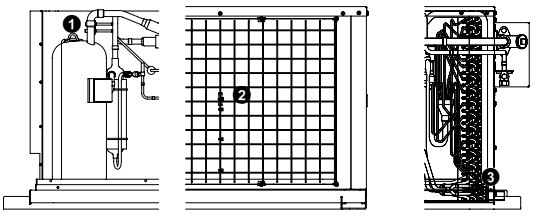


Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty thermistor for the evaporating temperature during heating	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the wiring to PCB	Repair the wiring and the connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

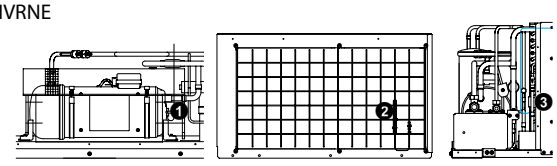
Thermistor characteristics



RASC-10HRNE



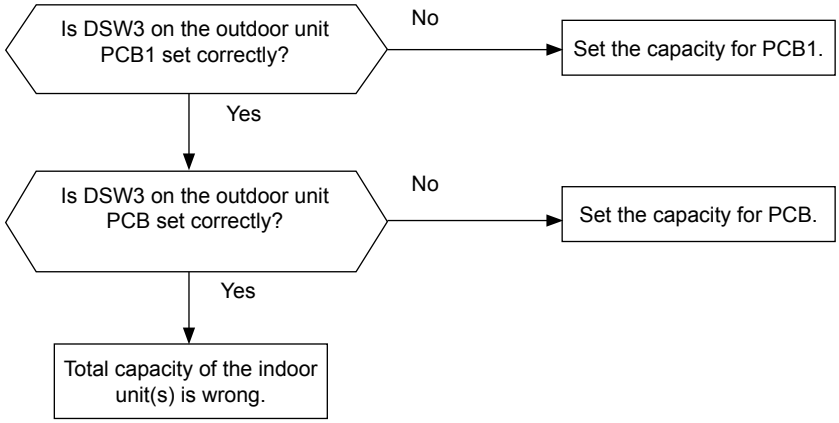
RASC-(3/5)HVRNE



Number	Identification
❶	Thermistor for discharge gas temperature
❷	Thermistor for outdoor ambient temperature
❸	Thermistor for evaporating temperature

Alarm code	Description
31	**Incorrect capacity setting or combined capacity between indoor units and outdoor unit**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  – This alarm code is indicated when the total indoor unit capacity is not equal to the combined outdoor unit capacity. Outdoor unit capacity setting is not correct.


Is DSW3 on the outdoor unit PCB1 set correctly?
No
Set the capacity for PCB1.
Yes
Is DSW3 on the outdoor unit PCB set correctly?
No
Set the capacity for PCB.
Yes
Total capacity of the indoor unit(s) is wrong.

Phenomenon	Cause	Check item	Action (Turn OFF main switch)
Incorrect capacity setting of indoor unit		Check combination of indoor units and capacity setting on PCB.	Correctly set dip switch, DSW3.
Incorrect capacity setting of outdoor unit		Check capacity setting on outdoor unit PCB.	Correctly set dip switch, DSW3.
Total indoor unit capacity connected to the outdoor unit is beyond permissible range		Check outdoor unit model by calculating total indoor units capacity.	Ensure that total indoor unit capacity is from 80% to 120%.

7

NOTE

- *In case of H-LINK system, this alarm code is indicated when DSW4, RSW1 (for refrigerant system setting) on the outdoor unit PCB and DSW5, RSW2 (for refrigerant system setting) on the indoor unit PCB are incorrectly set.*
- *In this case, set correctly DSW4, RSW1, DSW5 and RSW2 after turning OFF main switch.*
- *(DSW2 is not equipped with some models.)*

Alarm code	Description
35	**Incorrect indoor number setting**

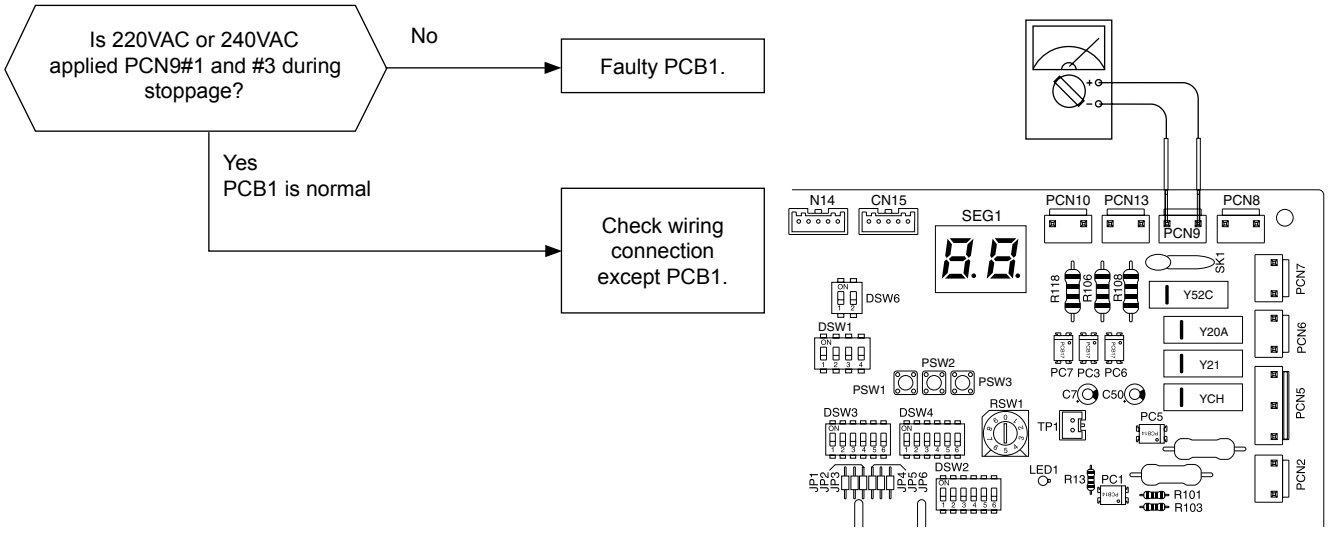
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  – This alarm code is indicated 3 minutes after power is supplied to the outdoor unit when the indoor unit no. connected to the outdoor unit is duplicated by setting of RSW.
  – This alarm code is indicated when 5 or more indoor units are connected to one outdoor unit.

NOTE

- *In case of H-LINK system, this alarm code is indicated when DSW4, RSW1 (for refrigerant system setting) on the outdoor unit PCB and DSW5, RSW2 (for refrigerant system setting) on the indoor unit PCB are incorrectly set.*
- *In this case, set correctly DSW4, RSW1, DSW5 and RSW2 after turning OFF main switch.*
- *(DSW2 is not equipped with some models.)*

Alarm code	Description
38	**Abnormality of protective circuit for protection (outdoor unit)**

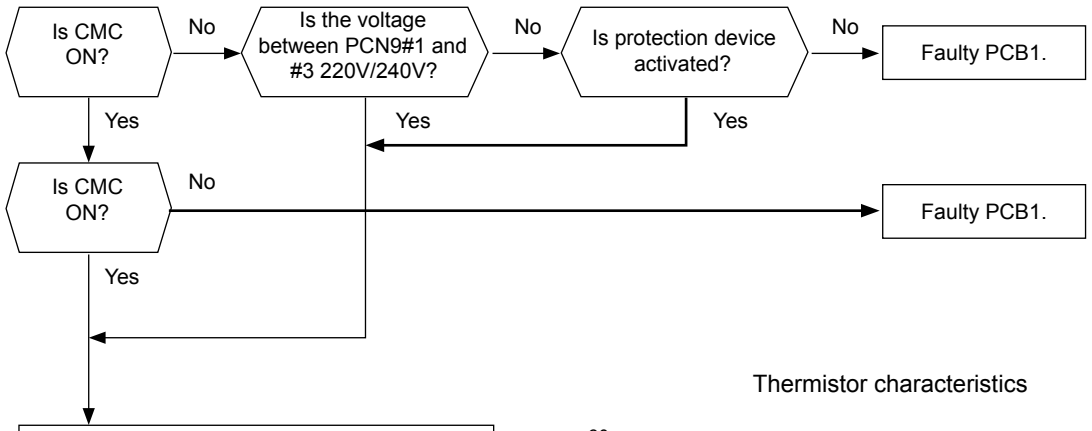
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
- This alarm code is indicated when AC 220V or 240V is supplied to voltage PCN9#1 and #3 on PCB1 in the outdoor unit during CMC is opened.



Phenomenon	Cause	Check item	Action (Turn OFF main switch)
Faulty PCB1		Check PCB1 by seft-checking	Replace PCB1

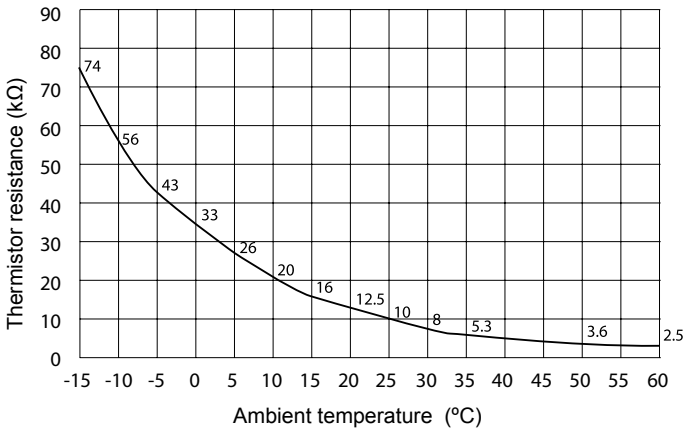
Alarm code	Description
41	**Cooling overload (high pressure switch will be activated)**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  – This alarm code is indicated when the protection device is activated at following condition. Evaporation temperature of outdoor unit is more than 55 degree and top of compressor temperature is more than 95 degree.



Check the following value by remote control switch.
1. Top of compressor temperature: 95ºC or less
2. Liquid refrigerant piping temperature of indoor unit: 55ºC or less if exceeding the above value, repair it.

Thermistor characteristics



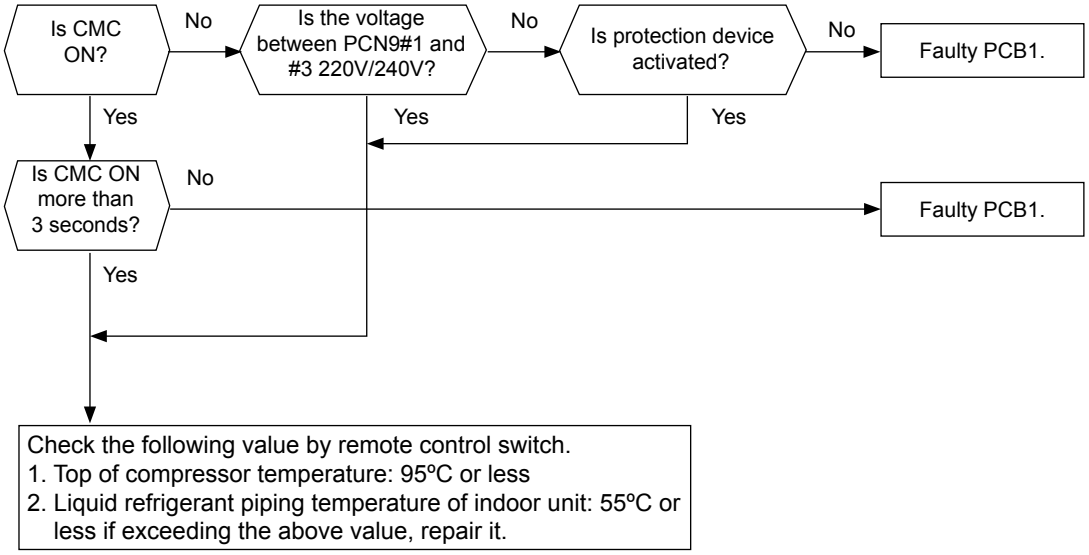
Phenomenon	Cause		Check item	Action (Turn OFF main switch)
Activation of high pressure switch due to excessively high discharge pressure during cooling operation	Insufficient air flow to heat exchanger of outdoor unit		Clogging of heat exchanger?	Remover clogging
			Check for dust on air filter	Remove dust
			Check the service space	Secure service space
			Check fan speed: Outdoor fan: cooling Indoor fan: heating	Replace fan motor if faulty
	Excessively high temp. air to outdoor unit heat exchanger		Check for hot air near the ceiling.	Make good circulation.
			Check for short circuited air.	Remove short-circuited air.
			Check for other Rasc Unit.	Remove Rasc Unit.
	Faulty high pressure switch	Faulty pressure switch	Measure discharge pressure. Check continuity after decreasing of pressure.	Replace it if faulty.
		Insufficient contacting	Measure resistance by tester.	Repair looseness. Replace connector.
		Incorrect connection	Check connections.	Repair connections.
	Overcharged refrigerant		Check cycle operating temp.	Charge refrigerant correctly.
	Mixture of non-condensable gas in refrigerant cycle		Check ambient temp. and pressure.	Recharge refrigerant after vacuum pumping.
	Clogging of discharge piping		Check for clogging.	Remove clogging.
	Faulty or malfunction of expansion valve		Check for clogging.	Remove clogging.
			Check connecting wiring and connectors.	Replace connector.
			Check operating sound from coil.	Replace coil.
			Check discharge gas thermistor.	Replace thermistor.
			Check attaching state of discharge gas thermistor.	Reattach thermistor.
	Liquid line stop valve or gas line stop valve are not in operation		Check stop valves.	Fully open stop valve.
	Locking up outdoor unit expansion valve closure		Check expansion valve actuation.	Replace outdoor unit expansion valve.

NOTE

- *This alarm code is indicated when the outdoor unit protective device is activated by high discharge pressure during cooling operation. Accordingly, when this alarm code is indicated, there is high possibility of high pressure switch actuation and the above troubleshooting actions are based on such cases.*

Alarm code	Description
42	**Heating overload (high pressure switch will be activate)**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  – This alarm code is indicated when the protection device is activated at following condition. Liquid refrigerant piping temperature of indoor unit is more than 55 ºC and top of compressor temperature is more than 95 ºC.


Is CMC ON?
No
Is the voltage between PCN9#1 and #3 220V/240V?
No
Is protection device activated?
No
Faulty PCB1.
Yes
Yes
Yes
Is CMC ON more than 3 seconds?
No
Faulty PCB1.
Yes
Check the following value by remote control switch.
1. Top of compressor temperature: 95ºC or less
2. Liquid refrigerant piping temperature of indoor unit: 55ºC or less if exceeding the above value, repair it.

Phenomenon	Cause	Check item	Action (Turn OFF main switch)
Activation of high pressure switch due to excessively high discharge pressure during heating operation	Insufficient air flow to heat exchanger of indoor unit	Clogging of Heat exchanger	Remove it
		Check for dust on air filter	
		Check for any obstacle at inlet or outlet of heat exchanger.	
		Check the service space.	Secure service space.
		Check fan speed. (Outdoor fan: cooling Indoor fan: heating)	Replace fan motor if faulty.

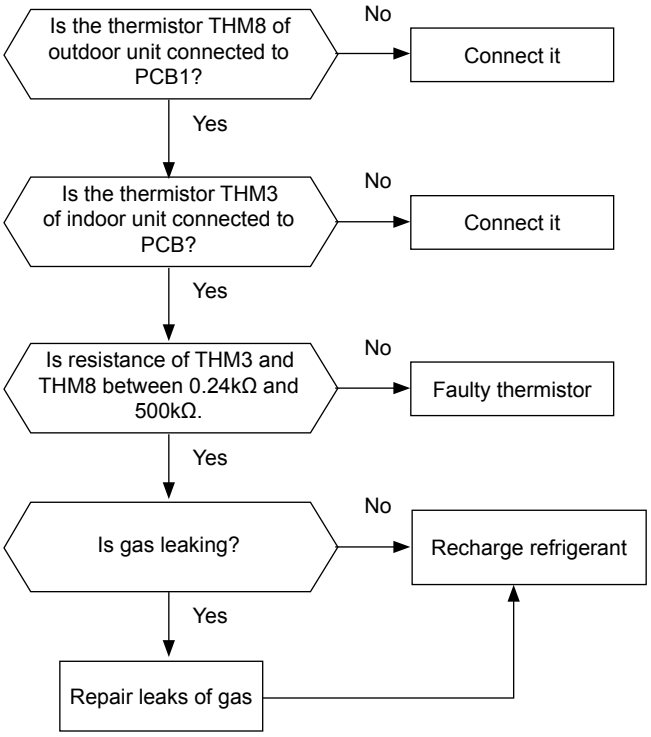
Phenomenon	Cause		Check item	Action (Turn OFF main switch)
Activation of high pressure switch due to excessively high discharge pressure during heating operation	Excessively high temp. air to indoor unit heat exchanger		Calculate heat load.	Reduce heat load or use a bigger unit.
			Check for hot air near the ceiling.	Make good circulation.
			Check for short circuited air.	Remove short-circuited air.
			Check for other RASC Unit.	Remove RASC Unit.
	Faulty high pressure switch	Faulty pressure switch	Measure discharge pressure. Check continuity after decreasing of pressure.	Replace it if faulty.
		Insufficient contacting	Measure resistance by tester.	Repair looseness. Replace connector.
		Incorrect connection	Check connections.	Repair connections.
	Faulty of outdoor fan control		Check decreasing air flow volume at pressure switch for control activative.	Replace thermistor for evaporating temp. if faulty.
	Faulty of pressure switch for control		Check activated pressure and connecting wire.	Replace it if pressure switch for control is faulty.
	Overcharged refrigerant		Check cycle operating temp.	Charge refrigerant correctly.
	Mixture of non-condensable gas in refrigerant cycle		Check ambient temp. and pressure.	Recharge refrigerant after vacuum pumping.
	Clogging of discharge piping		Check for clogging.	Remove clogging.
	Faulty or malfunction of expansion valve		Check for clogging.	Remove clogging.
			Check connecting wiring and connectors.	Replace connector.
			Check operating sound from coil.	Replace coil.
			Check discharge gas thermistor.	Replace thermistor.
			Check attaching state of discharge gas thermistor.	Reattach thermistor.
	Liquid line stop valve or gas line stop valve are not in operation		Check stop valves.	Fully open stop valve.

NOTE

- *This alarm code is indicated when the outdoor unit protective device is activated by high discharge pressure during heating operation. Accordingly, when this alarm code is indicated, there is high possibility of high pressure switch actuation and the above troubleshooting actions are based on such cases.*

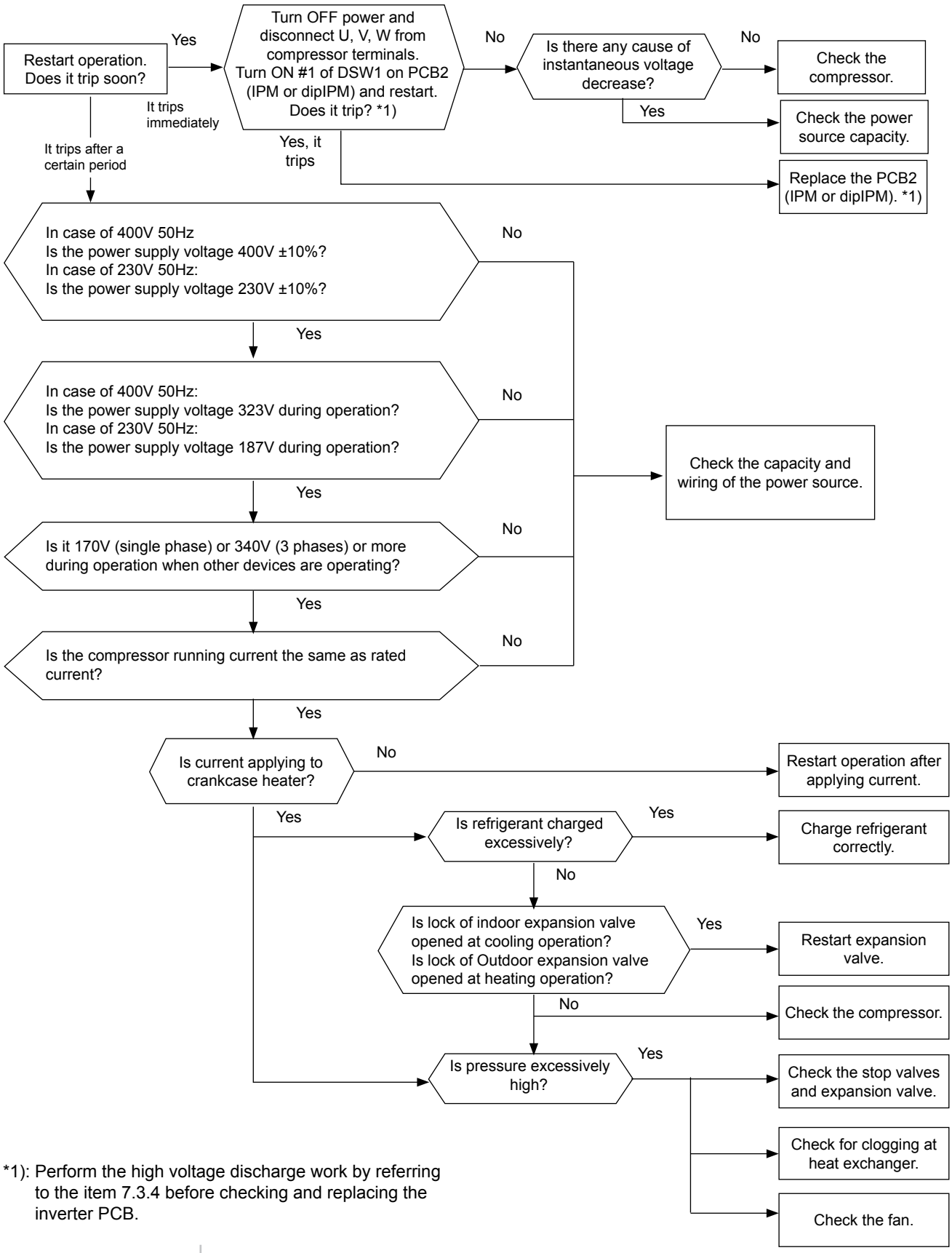
Alarm code	Description
47	**Activation to protect system from excessively low suction pressure (protection from vacuum operation)**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - In the case that the evaporating temperature (Cooling: liquid refrigerant piping temp. of indoor unit, heating: evaporating temp. of outdoor unit) is lower than -37 ºC (250~350 kΩ) and the thermistor on top of compressor is higher than 90 ºC. for 3 minutes, retry operation is performed 3 minutes after compressor stoppage. However, when the state occurs more than 3 times including 3 in one hour, this alarm code is indicated.



Phenomenon	Cause	Check item	Action (Turn OFF main switch)
– Faulty freeze protection – Thermistor of indoor unit – Evaporating thermistor of outdoor unit	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect connection	Check wiring to PCB.	Repair wiring and connections.
Faulty PCB (Outdoor unit, indoor unit)		Replace PCB and check operation.	Replace PCB if faulty.
Excessively low suction pressure (in vacuum)	Liquid line stop valve is not open before operation	Check stop valve.	Fully open stop valve.
	Faulty or malfunction of expansion valve	Check for clogging.	Remove clogging.
		Check connecting wiring and connectors.	Replace connector.
		Check operating sound from coil.	Replace coil.
		Check discharge gas thermistor.	Replace thermistor.
		Check attaching state of discharge gas thermistor.	Reattach thermistor.
	Refrigerant leakage	Check each temp. and pressure.	Charge refrigerant after vacuum pumping.
		Check gas leakage part.	Correctly charge refrigerant after repairing gas leakage.
Faulty RASC fan at heating operation	Faulty RASC fan motor	Measure coil resistance and insulating resistance.	Replace RASC fan motor if faulty.

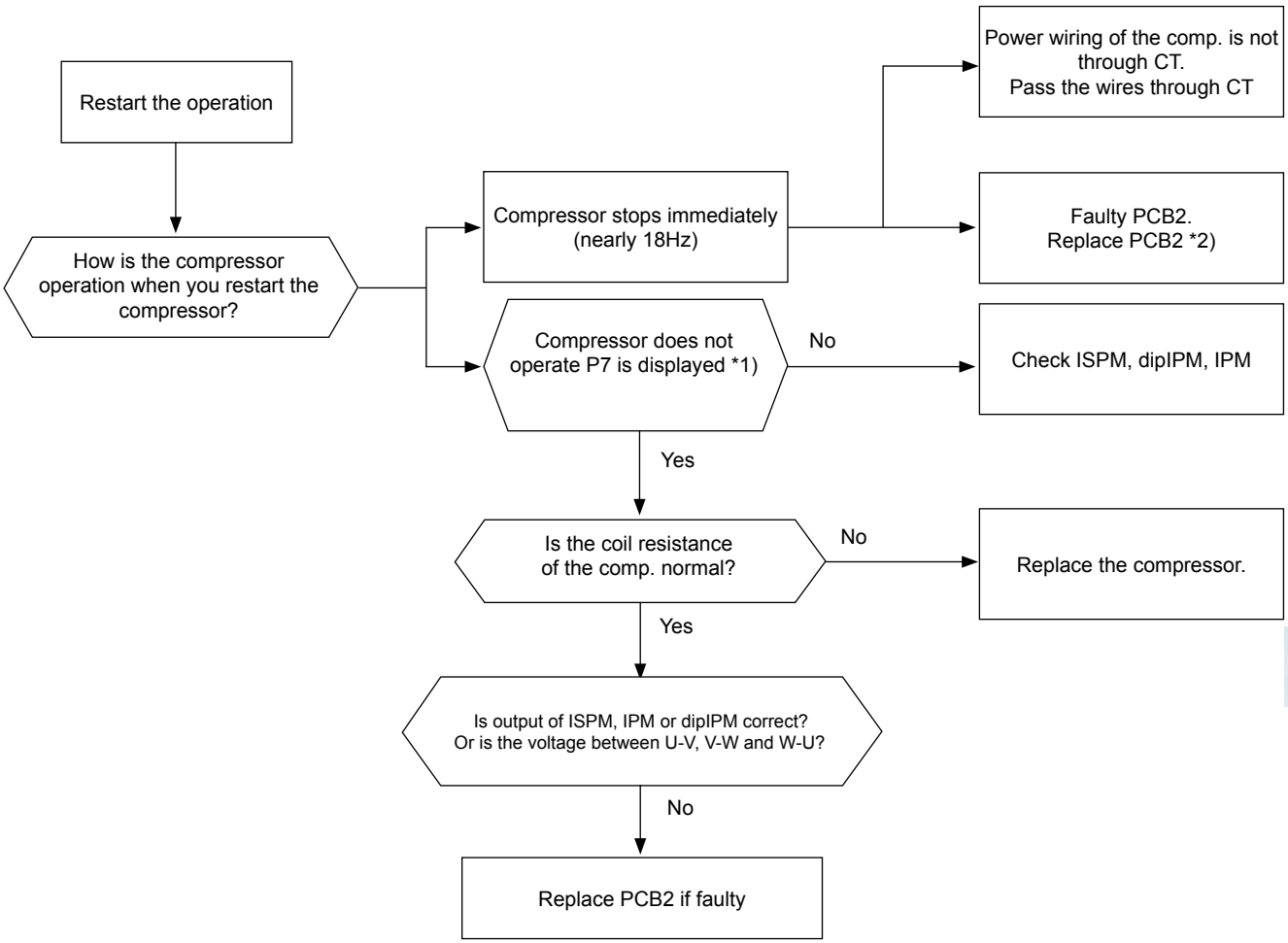
Alarm code	Description
48	**Overcurrent protection activation**


Restart operation. Does it trip soon?
Yes
It trips immediately
It trips after a certain period
Turn OFF power and disconnect U, V, W from compressor terminals. Turn ON #1 of DSW1 on PCB2 (IPM or dipIPM) and restart. Does it trip? *1)
No
Is there any cause of instantaneous voltage decrease?
No
Check the compressor.
Yes
Check the power source capacity.
Yes, it trips
Replace the PCB2 (IPM or dipIPM). *1)
In case of 400V 50Hz
Is the power supply voltage 400V ±10%?
In case of 230V 50Hz:
Is the power supply voltage 230V ±10%?
No
Yes
In case of 400V 50Hz:
Is the power supply voltage 323V during operation?
In case of 230V 50Hz:
Is the power supply voltage 187V during operation?
No
Yes
Is it 170V (single phase) or 340V (3 phases) or more during operation when other devices are operating?
No
Yes
Is the compressor running current the same as rated current?
No
Yes
Check the capacity and wiring of the power source.
Is current applying to crankcase heater?
No
Restart operation after applying current.
Yes
Is refrigerant charged excessively?
Yes
Charge refrigerant correctly.
No
Is lock of indoor expansion valve opened at cooling operation?
Is lock of Outdoor expansion valve opened at heating operation?
Yes
Restart expansion valve.
No
Check the compressor.
Is pressure excessively high?
Yes
Check the stop valves and expansion valve.
Check for clogging at heat exchanger.
Check the fan.

*1): Perform the high voltage discharge work by referring to the item 7.3.4 before checking and replacing the inverter PCB.

Alarm code	Description
51	**Abnormal operation of the current transformer (0A detection)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the Outdoor unit PCB.
  – This alarm code is displayed when the current transformer is abnormal (0A detection or 5A alarm condition) and the alarm has more than three occurrences in 30 minutes.
  – Condition of activation:
  When the frequency of the compressor is maintained at 15~18Hz after the compressor is started, one of the absolute values of the running current at each phase U+, U-, V+ and V- is less than 1.5A (including 1.5A).

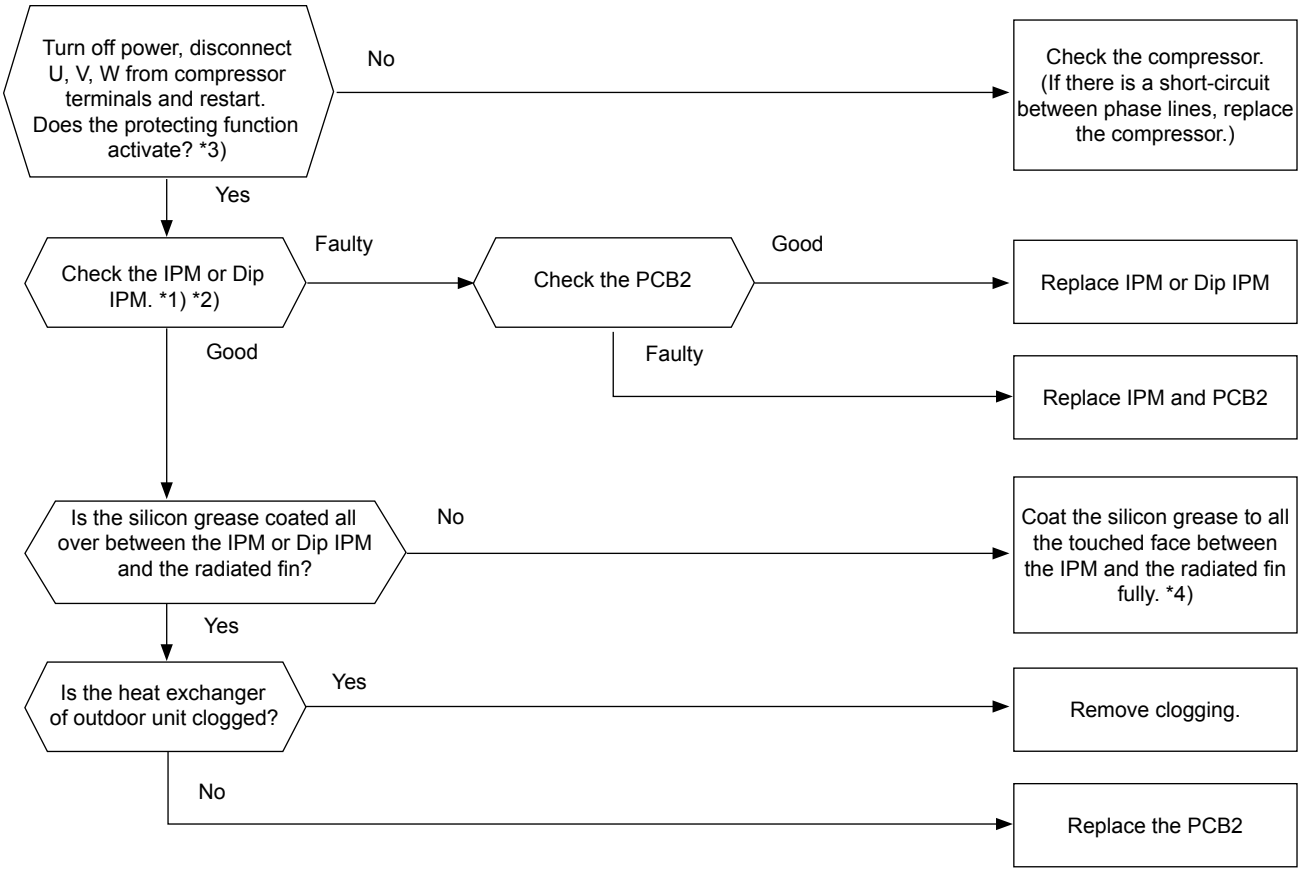

Restart the operation
How is the compressor operation when you restart the compressor?
Compressor stops immediately (nearly 18Hz)
Power wiring of the comp. is not through CT.
Pass the wires through CT
Faulty PCB2.
Replace PCB2 *2)
Compressor does not operate P7 is displayed *1)
No
Check ISPM, dipIPM, IPM
Yes
Is the coil resistance of the comp. normal?
No
Replace the compressor.
Yes
Is output of ISPM, IPM or dipIPM correct?
Or is the voltage between U-V, V-W and W-U?
No
Replace PCB2 if faulty

*1): P7 is shown at 7-segment on the Outdoor unit PCB.
*2): Perform the high voltage discharge work by referring to the item 7.3.4 before checking and replacing the inverter parts.

Alarm code	Description
53	**Protection activation of IPM or DipIPM and PCB2 (RASC-(3/5)HVRNE and RASC-10HRNE)**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the RASC unit PCB.
  – IPM or Dip IPM and PCB2 have detecting function of abnormality.
  This alarm is indicated when the transistor module detect the abnormality 7 times in 30 minutes including 7. Retry operation is performed up to the occurrence of 6 times.

Conditions:
Abnormal current to the transistor module such as
Short circuited or grounded
or
Abnormal temperature of the IPM or Dip IPMand PCB2
or
Control voltage decrease


Turn off power, disconnect U, V, W from compressor terminals and restart. Does the protecting function activate? *3)
No
Check the compressor. (If there is a short-circuit between phase lines, replace the compressor.)
Yes
Check the IPM or Dip IPM. *1) *2)
Faulty
Check the PCB2
Good
Replace IPM or Dip IPM
Good
Faulty
Replace IPM and PCB2
Is the silicon grease coated all over between the IPM or Dip IPM and the radiated fin?
No
Coat the silicon grease to all the touched face between the IPM and the radiated fin fully. *4)
Yes
Is the heat exchanger of outdoor unit clogged?
Yes
Remove clogging.
No
Replace the PCB2

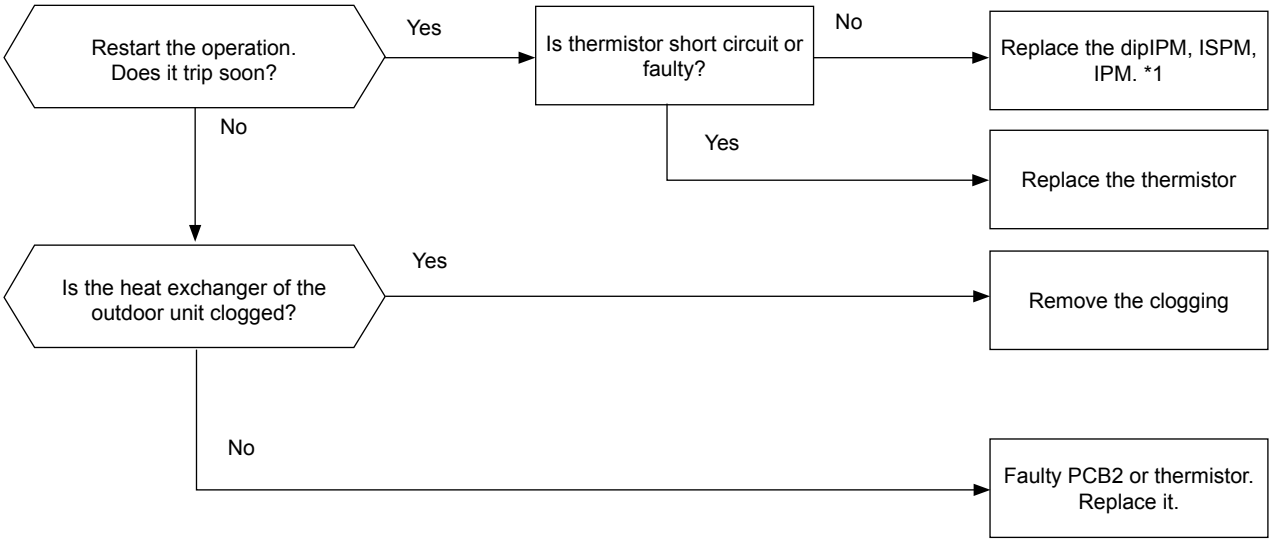
*1) Perform the high voltage discharge work by referring to the item 7.3.4 before checking and replacing the inverter components.
*2) Regarding replacing or checking method for inverter components, refer to the item 7.3.4.
*3) Turn ON the No.1 switch of the dip switch DSW1 on PCB2 when restarting with disconnecting the terminals of the compressor. After troubleshooting, turn OFF the No.1 switch of the dip switch DSW1 on PCB2.
*4) Use the silicon grease provided as accessory (Service parts No. P22760).

Alarm code	Description
54	**Temperature increase in the inverter fin**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  – If the alarm code “51” or “54” occurs three times within 30 minutes, the alarm code which occurred for the third time is displayed. The retry operation is performed twice.

Conditions:

When the temperature of the thermistor for inverter fin excess 100 ºC (RASC-10HRNE, 80 ºC RASC-(3/5)HVRNE) 3 times in 30 minutes, this alarm is indicated and the operation is stopped. In the case the occurrence is smaller than 2 times, retry is performed.



1*): Perform the high voltage discharge work by referring to the item 7.3.4 before checking and replacing the inverter components.

Alarm code	Description
55	**IPM or PCB2 abnormality**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  – In case that the abnormality of alarm code 55 occurs four times within 30 minutes, the alarm code of abnormality occurred for the fourth time is indicated. Retry operation is performed up to third time of abnormality occurrence.

Conditions:

When the transmitting abnormality occurs between dipIPM (or IPM) and PCB2), this alarm is indicated and the operation is stopped.

Troubleshooting:

Replace the PCB2.

Alarm code	Description
EE	**Compressor protection**
• This alarm code is displayed when one of the following alarms occurs three times within six hours. If the outdoor unit operates continuously without removing the cause of the alarm, the compressor may be seriously damaged.	

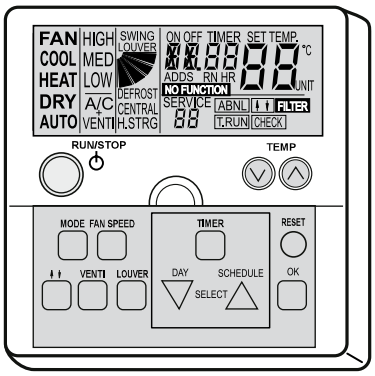
Alarm code	Content of abnormality
02	Tripping of protection device in outdoor unit
07	Decrease in discharge gas superheat
08	Increase in discharge gas temperature
41	Cooling overload
42	Heating overload
47	Low pressure decrease protection activating

You can check these alarms using the check mode 1. Follow the action that is indicated in each alarm chart. You can clear these alarms only by turning OFF the main switch to the system. **However, you must pay careful attention before starting, because there is a possibility of causing serious damages to the compressors.**

7.2.3. Troubleshooting in check mode

Use the “OK” switch of the remote control in the following cases:

1. When the RUN LED is flickering.
2. To trace back the cause of the malfunction after restarting from the stoppage while the RUN LED is flickering.
3. To check during the normal operation or during the stoppage.
4. To monitor the inlet air temperature and the discharge air temperature.



Check mode

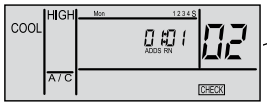
- Check mode 1: Current data will be displayed
- Check mode 2: The data which was held immediately before the failure will be displayed

Pres “OK” for more than 3 seconds

Normal mode

– The indication will delay as the transmission between the remote control switch and the indoor unit takes about ten seconds.
– All the data may be displayed as "FF" or " 1" or "255".
These transient data, which are produced temporarily by the software, do not affect the device functions at all. (The alarm code may also be displayed as "FF".)

Unit number and alarm code displayed



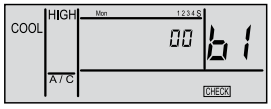
The alarm code that identifies the last fault that has occurred in the displayed unit.
The unit number of the connected unit or the unit number for which the checking mode was selected previously.
ADDS: Number of the indoor unit in no. ** cycle
RN: No. ** refrigerant cycle

After seven seconds ← (A)

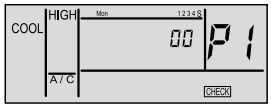
Within seven seconds to check another unit

Forward:
Press the "⌃" switch to increase from 00 to 01 to 02 ···
Backward:
Press the "⌄" switch to decrease from 15 to 14 to 13 ···

Check mode 1

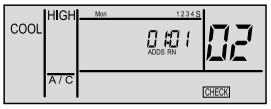


Press "⌄" to see the previous indication
Press "⌃" to see the next indication



Pres “OK” for more than 3 seconds

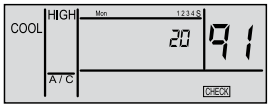
Unit number and alarm code displayed



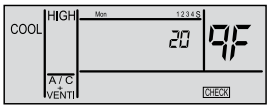
Press "⌃" to see the next data
Press "⌄" to see the previous data

After seven seconds ← See (A)

Check mode 2 (Refer to "check mode 1" for details)



Press "⌃"

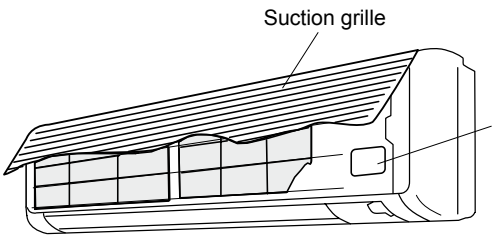


– In the check mode 2, the data of the first three units that are connected serially to a remote control switch are available.
– You can press the “OK” switch to disable the check mode 2. Check mode 1 cannot be disabled even if you press the “OK” switch.

Pres “OK” for more than 3 seconds

Check mode disabled

Although the wireless controller is used for the wall type indoor unit with the built-in receiver part, you can check the alarm code by connecting the PC-P2HTE.



NOTE

- *The unit does not operate by pressing the operation switch.*
- *The above function is available only when the alarm occurs.*
- *The PCB check using the remote control switch is not available.*
- *The indication is the data when you are connecting PC-P2HTE. The indication is not the data before the alarm occurs.*

- **Contents of the check mode 1**

The next indication is shown if you press the part "△" of the TEMP switch.

If you press the part "▽" of the TEMP switch, the previous indication is shown.

Temperature indication

1	Indoor unit temp. setting (°C)	b1 22
2	Indoor unit air inlet temp. at thermistor (°C)	b2 20
3	Indoor unit discharge air temp. at thermistor (°C)	b3 55
4	Indoor unit heat exchanger liquid pipe temp °C	b4 20
5	Temperature at remote sensor (°C)	b5 25
6	Outdoor unit ambient temp. (°C)	b6 10
7	Indoor unit heat exchanger gas pipe temp. (°C)	b7 25
8	Outdoor unit evaporating temp. during heating (°C)	b8 02
9	Control information	b9 --
10	Discharge gas temp. at the top of the comp. chamber (°C)	bA 41
11	Thermo temp. of the remote control switch	bb 23

Indication of the category code
Indication of the temperature, etc

Normal ... Temperature displayed

Abormal
- -- (Thermistor is open-circuited or PCB is defective)
or
129 (Temp. for top of comp.)
or
FF (Thermistor is short-circuited or PCB is defective)
or
255
or
127 (Temp. for top of comp.)

Refer to section 7.3.1 "self-checking procedure of PCB using the remote control switch"

During the transient periods such as starting time and other, the indicators "- -" or "00" may be displayed for a limited time.

This is indicated only when a remote sensor is connected.
The indicator "--" is normally displayed.
RPK series cannot connect a remote sensor.
Therefore, the indicator is "--".

This indicates the internal information for the remote control switch

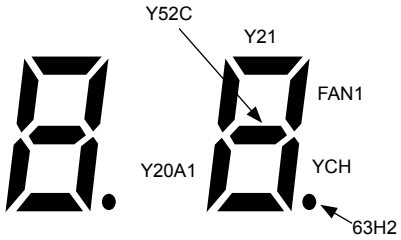
(Ex.) During the operaton of several compressors, the average temperature of two compressors is indicated.

If the temperature is higher than 126 ºC, " 126"

7

Indication of micro-computer input/output

12	Micro-computer input/ output in indoor unit	C1	4
13	Micro-computer input/ output in outdoor unit	C2	-



PCB relay	Part name
Y21	Relay for 4-way valve
Y52C	Relay for compressor
Y20A1	Relay for selonoid valve (SVA)
FAN1	Relay for RASC fan.
YCH	Relay for cranckcase heater
63H2	Relay for PSH

Indication of unit stoppage cause

14	Cause of stoppage	d1	01

00	Operation OFF, power OFF
01	Thermo - OFF (note 1)
02	Alarm (note 2)
03	Freeze protection, overheating protection
05	Instantaneous power failure at outdoor unit, reset (note 3)
06	Instantaneous power failure at indoor unit, reset (note 4)
07	Stoppage of cooling operation due to low outdoor air temperature (<= -5ºC), Stoppage of heating operation due to high outdoor air temperature, and high indoor air temperature, stoppage of heating operation due to low outdoor air temperature (<= -20ºC)
10	Demand, enforced stoppage
13	Retry due to high pressure increase
15	Retry due to abnormal high temperature of discharge gas, excessive low suction pressure
16	Retry due to decrease of discharge gas superheat
17	Retry due to inverter tripping
18	Retry due to voltage decrease
19	Expansion valve opening change protection
20	Operation mode changeover of indoor unit (note 5)
21	Enforced thermo-off, when other indoor unit thermo-off
22	Hot start after 4 hours switch on the outdoor unit
24	Cold draft protection 2

NOTE

- *Explanation of Terms*
- *Thermo-ON: A condition where an indoor unit is requesting the compressor to operate.*
- *Thermo-OFF: A condition where an indoor unit is not requesting the compressor to operate.*
- *Even if stoppage is caused by "Alarm", "02" is not always displayed.*
- *If the transmission between the inverter printed circuit board and the control printed circuit board is not performed during 30 seconds, the stoppage cause is d1-05 and the alarm code "04" may be displayed.*
- *If the transmission between the indoor unit and the outdoor unit is not performed during three minutes, the Indoor Units are stopped.*
- *In this case, the stoppage cause is d1-06 and the alarm code "03" may be displayed.*
- *In the system "20" will be indicated at the diference between indoor units.*

Abnormal operation occurrence counter

15	Abnormal operation occurrence counter	E1	01
16	Instantaneous power failure occurrence counter in indoor unit	E2	00
17	Transmission error occurrence counter between remote control switch and indoor unit	E3	00
18	Abnormal operation occurrence counter on inverter	E4	00

Countable up to 99.

Over 99 times, "99" is always displayed.

NOTE

- *If a transmission error continues for three minutes, one is added to the occurrence counter.*
- *The memorized data can be cancelled by the method which is explained in section 7.3.1 "self-checking procedure of PCB using the remote control switch".*

Indication of automatic louver condition

19	Louver sensor	F1	00

00 : Normal

FF : Abnormal

Compressor pressure/frequency indication

20	Discharge pressure (high) (x 0.1 MPa)	H1 18
21	Suction pressure (low) (x 0.01 MPa)	H2 04
22	Control information	H3 44
23	Operation frequency (Hz)	H4 44

This is an indication for internal information for the remote control switch. This does not have any specific meaning

The total frequency is displayed when several compressors are running.

Indoor unit capacity indication

24	Indoor unit capacity	J1 08
25	Outdoor unit code	J2 Fn
26	Refrigerant cycle number	J3 01
27	Refrigerant cycle number	J4 00

This is an indication for frequency inverter

Capacity code of indoor unit

Indication code	Equivalent capacity (HP)
06	0.8
08	1.0
10	1.3
13	1.5
14	1.8
16	2.0
18	2.3
20	2.5
22	2.8
26	3.0/3.5
32	4.0
40	5.0
48	6.0
64	8.0
80	10.0

"n" indicates the total number of Indoor Units: 1 ~ 4

J3: 01 ~ 64 (01: when shipment (DSW5+RSW2), decimal indication

J4: 00 ~ 40 (00: when shipment (DSW5+RSW2), indication with 16 numbers

Expansion opening indication

28	Indoor unit expansion valve opening (%)	L1 20

29	Outdoor unit expansion valve MV1 opening (%)	L2 99
30	Outdoor unit expansion valve MV2 opening (%)	L3 99
31	Outdoor unit expansion valve MVB opening (%)	L4 00

The indication of 255 is normal

Estimated electric current indication

32	Compressor running current (A)	P1 25

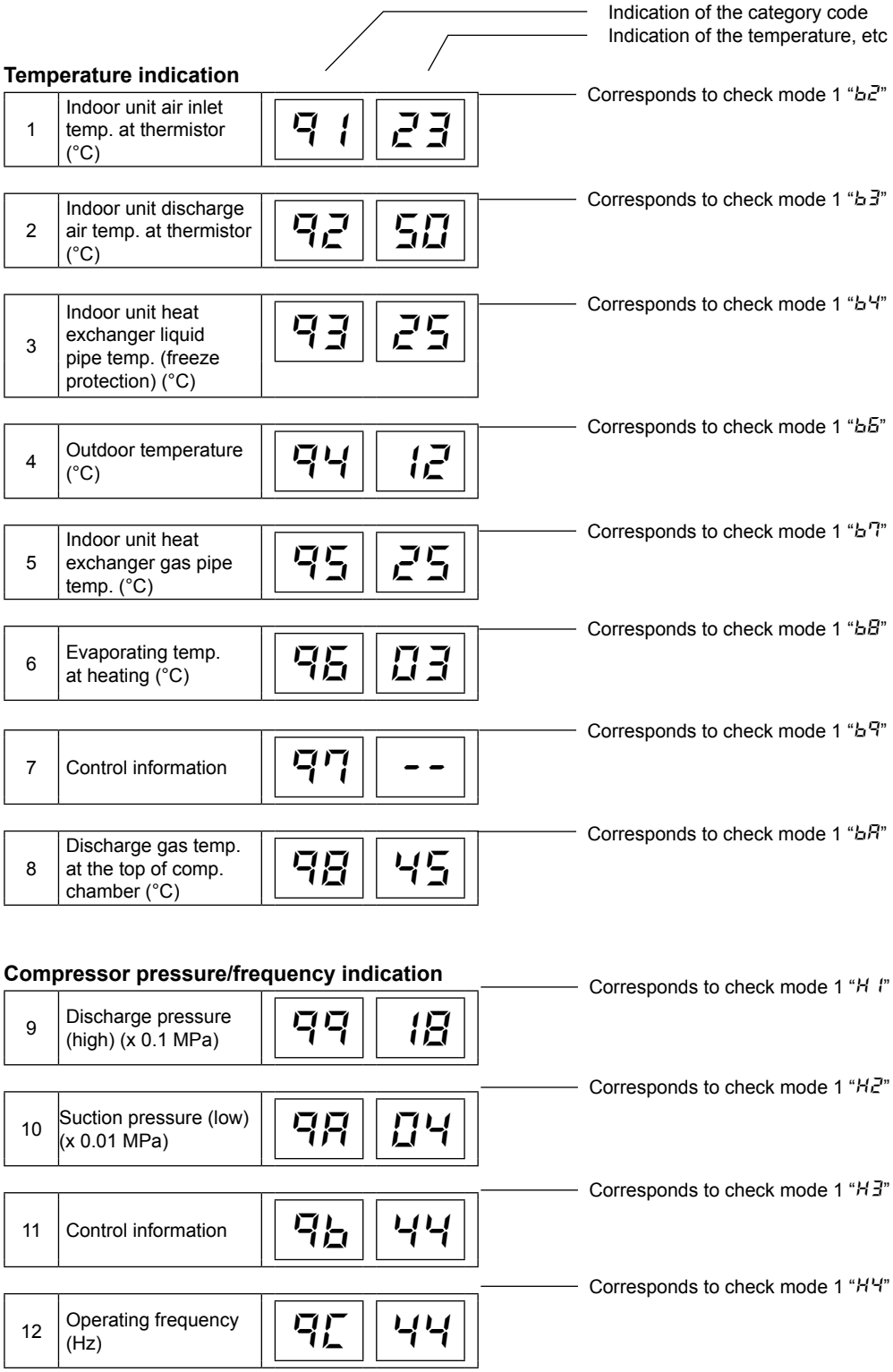
The total current is displayed when several compressors are running. In case of the inverter compressor, the running current of the primary side of the inverter is displayed.

☛ Returns to **temperature indication**

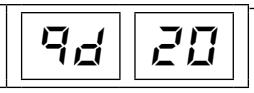
- **Contents of the check mode 2**

When more than three indoor units are connected to one remote control switch, the latest data of only the first three indoor units that are connected serially are displayed.

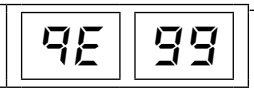
If you press the part "⌃" of the TEMP switch, the next display appears. If you press the part "⌄" of the TEMP switch, the previous display appears.



Expansion opening indication

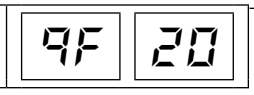
13	Indoor unit expansion valve opening (%)	

Corresponds to check mode 1 "H2"

14	Outdoor unit expansion valve mv1 opening (%)	

Corresponds to check mode 1 "H3"

Estimated electric current indication

15	Compressor running current (A)	

Corresponds to check mode 1 "H4"
The total value is displayed when several compressors are running

☛ Returns to **temperature indication**

7.2.4. Troubleshooting using the 7 segment display

- **Simple checking by 7-segment display**

1	Turn ON all indoor inits connected to the outdoor unit
2	Turn ON the outdoor unit
3	Auto-addressing starts

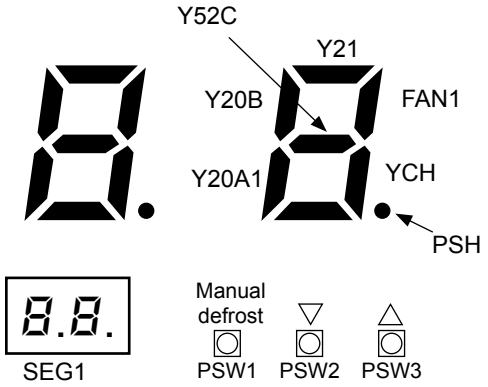
Outdoor unit, circuit board, PCB1

During auto-addressing, the following items can be checked using the outdoor unit's on-board 7-segment LED display:

1. Disconnection of power supply to the indoor unit.
2. Reverse connection of the operating line between the outdoor and indoor units.
3. Duplication of indoor unit number.

- **Checking method by 7-segment display**

Operating conditions and each part of refrigeration cycle can be checked by 7-segment and push switches (PSW) on the PCB in the outdoor unit. During checking data, do not touch the electric parts except for the indicated switches because 220-240V is applied to them. Pay attention not to contact the tools with electrical parts. If contacted, electrical parts will be damaged



– To start checking, press PSW2 switch for more than three seconds.
– To proceed checking, press the PSW2 switch.
– To back to the previous item, press the PSW3 switch.
– To cancel this checking, press the PSW2 switch for more than 3 seconds.

Item	Item		Indication data		
	Check No.	Indic.	Indic.	Contents	
Total capacity of indoor unit connected	01	CP	22	00~96	
Input/output state of outdoor micro-computer	02	SC	3	Indicates only for the segments corresponding to the equipment in the figure. (See figure above)	
Alarm code for abnormal stoppage of compressor	03	AC	08	Alarm code on compressor	
Inverter order frequency to compressor	04	H1	74	30~115 (Hz) In case that frequency is higher than 100Hz, the last two digits flicker	
Indoor order frequency to compressor	05	H2	74	30~115 (Hz) In case that frequency is higher than 100Hz, last two digits flicker	
Air flow ratio	06	Fo	80	00~100 (%) In case that air flow ratio is 100%, "00" flashes	
Outdoor unit expansion valve opening	07	Eo	30	00~100 (%) In case that expansion valve opening is 100%, "00" flashes	
Temperature at the top of compressor	08	Td	02	00~142 (ºC) In case that temperature is higher than 100ºC, the last two digits flash	
Evaporating temperature at heating	09	TE	-2	-19~80ºC	
Ambient air temperature	10	To	-3	-19~80ºC	
Cause of stoppage at inverter	11	dF	1	(See table at the next page)	
Control information	12	TF	20	Internal information of outdoor unit PCB	
Control information	13	A1	12	Internal information of outdoor unit PCB	
Inverter secondary current	14	A2	20	00~199 (A)	
Outdoor unit address	15	nA	00	00~15	In case of twin/triple/quad-type unit, the information of 2nd to the 4th indoor units is indicated repeatedly. The right character of the indication represents the indoor unit setting No. Single: A Twin: A, b Triple: A, b, c Quad: A, b, c, d
Indoor unit expansion valve opening	16	EA	20	00~100 (%) In case that opening is 100%. "00" flashes	
Liquid pipe temperature of indoor unit (freeze protection)	17	LA	05	-19~127 (ºC)	
Indoor unit intake air temperature	18	iA	28	-19~127 (ºC)	
Indoor unit discharge air temperature	19	oA	20	-19~127 (ºC)	
Cause of indoor unit stoppage	20	dA	05	(See table at the next page)	

Cause of inverter stoppage (11)

Indication	Contents
1	IPM, ISPM, dipIPM error
2	Instantaneous over current
3	Inverter fin thermistor protection activation
4	Electronic thermal activation
5	Inverter voltage decrease
6	Over voltage
7	Abnormal transmission
8	Abnormal current detection
9	Instantaneous power failure detection
11	Reset of micro-computer for inverter
12	Earth fault detection from compressor
13	Open phase detection
14	Inverter malfunction
15	Inverter malfunction
16	Inverter malfunction
17	Transmission error
18	Abnormal current detection
19	Abnormal protective device

NOTE
- *To finish checking: press the PSW2 switch for more than 3 seconds.*

Cause of indoor unit stoppage (20)

Indication	Contents
00	Operation OFF, Power OFF
01	Thermo-OFF
02	Alarm
03	Freeze protection overheating protection
05	Instantaneous power failure at outdoor unit
06	Instantaneous power failure at indoor unit
07	Stoppage of cooling operation due to low outdoor air temperature Stoppage of heating operation due to high outdoor air temperature
10	Demand thermo OFF
13	Retry for Pd increase prevention
15	Vacuum/discharge gas temperature increase retry
16	Retry due to discharge gas SUPERHEAT decrease
17	IPM error retry, instantaneous over current of inverter retry, electronic thermal activation of inverter retry, abnormal current sensor of inverter retry
18	Retry due to inverter voltage decrease Retry due to Inverter Overvoltage
19	Other retry
20	Different operation mode between indoor/ outdoor units (Only for individual twin/triple/quad types)
21	Forced thermo-OFF (Only for simultaneous twin/triple/quad types)
22	Forced thermo-OFF (During compressor pre-heating)
24	Thermo-OFF during energy saving operation mode

Cancelation of Forced Thermo OFF

Turn ON the power source and wait for more than 30 seconds. Then press PSW1 and PSW3 simultaneously for more than 3 seconds.

Forced thermo-OFF (indoor unit error code 22) will be cancelled.

However, this function may damage the compressor, use only on inevitable occasion.

In case of using the remote control switch (PC-P1HE), the cancellation is also available with it.

When “operation is limited” indication flashes on the remote control LCD, press FAN SPEED and LOUVER switches simultaneously for more than 3 seconds.

“Operation is limited” indication is disappeared and operation is available.

7.2.5. Cause of inverter stoppage

Code	Cause	Cause of stoppage for corresponding unit	Remark	
			Indication during retry	Alarm code
1	Automatic stoppage of transistor module (IPM, ISPM, dipIPM Error) (Over current, decrease voltage, short circuit protection)	17	P7	53
2	Instantaneous over current	17	P7	48
3	Abnormal inverter fin thermistor	17	P7	54
4	Electronic thermal activation	17	P7	48
5	Inverter voltage decrease	18	P8	06
6	Over voltage	18	P8	06
7	Abnormal inverter transmission	18	-	-
8	Abnormal current detection	17	P7	51
9	Instantaneous power failure detection	18	-	-
11	Reset of micro-computer for inverter	18	-	-
12	Earth fault detection from compressor (Only starting)	17	P7	53
13	Abnormal power source phase (Open phase)	18	-	-
16	Inverter PCB abnormality	18	P8	55
17	Abnormal transmission	18	P8	55
18	Abnormal current detection	-	-	02
19	Abnormal protective device	-	-	38
20 ~ 63	Other factors	18	-	-

- **Protection control code on 7-segment display**
  1. Protection control code is displayed on 7-segment when a protection control is activated.
  2. Protection control code is displayed while function is working, and goes out when released.
  3. When several protection control are activated, code number with higher priority will be indicated (see below for the priority order).
     a) Higher priority is given to protection control related to frequency control than the other.
        <Priority order>
        * High-pressure increase protection
        * Over current protection
        * Cold draft protection
        * Low-pressure ratio control at cooling operation

     b) In relation to retry control, the latest retrial will be indicated unless a protection control related to frequency control is indicated.

Code		Protection control
P	0	Low-pressure ratio control at cooling operation
P	1	High-pressure ratio control at heating operation
P	2	High-pressure increase protection
P	3	Over current protection
P	4	IPM fin temperature increase protection
P	5	Discharge gas temperature increase protection

Code		Protection control
P	6	Frost formation protection
P	9	Unbalance power source detecting
P	A	Current demand control
P	b	Low-pressure decrease protection
P	C	Cold draft protection

– Retry indication continues for 30 minutes unless a protection control is indicated.
– Retry indication disappears if the stop signal comes from all rooms.

Code		Protection control
P	7	Inverter retry
P	8	

NOTE

- The protection control code being indicated on 7-segment display is changed to an alarm code when the abnormal operation occurs. Also, the same alarm code is indicated on the remote control switch.

- **Activating condition of protection control code**

For following the conditions as the temperature change, etc., the control of frequency, etc. is performed to prevent the abnormal conditions by the protection control. The activating conditions of protection control are shown in the table below.

Code	Protection control	Activating condition	Remarks
P0	Low-pressure ratio control at cooling operation	Compression ratio ε < 2.2 => frequency increase	ε = (Pd+0.1)/(Ps+0.1)
P1	High-pressure ratio control at heating operation	Compression ratio ε > 7.5 => frequency decrease	ε = (Pd+0.1)/(Ps+0.1)
P2	High-pressure increase protection	High pressure switch for control is activated => frequency decrease	
P3	Over current protection	Inverter output current > (*1)A => frequency decrease	
P4	dipIPM, ISPM or IPM temperature increase protection	Inverter fin temperature RASC-(3/5)HVRNE > 80 ºC RASC-10HRNE > 100 ºC => Frequency decrease	
P5	Discharge gas temperature increase protection	Temperature at the top of compressor is high => frequency decrease Temperature at the top of compressor > 107oC => indicate P5	
P6	Frost formation protection	TL ≤ 2ºC Over 3 minutes => Frequency decrease	TL: liquid piping, temperature of indoor unit
P9	Unbalance power source detecting	Inverter output current > 13A (380A) => frequency decrease	
PA	Current demand control	Inverter output current > (*2)A => frequency decrease	In case of demand control setting
Pb	Low-pressure decrease protection	Low pressure switch for control is activated. => frequency decrease	
PC	Cold draft protection	TO ≤ 10ºC and ε ≥ 2.6 => frequency decrease	ε = (Pd+0.1)/(Ps+0.1) TO: outlet temperature of indoor unit
P7	Inverter retry	Automatic stoppage of transistor module, activation of electronic thermal or abnormal current sensor	When activating 3 times in 30 minutes, “48”, “51”, “53” or “54” alarm is indicated.
P8	Inverter retry	Insufficient/excessive voltage at inverter Circuit or PCB connector part	When activating 3 times in 30 minutes, “06” or “55” alarm is indicated.

NOTE

- *During protection control (except during alarm stoppage), the protection control code is indicated.*
- *The protection control code is indicated during protection control and turns off when canceling the protection control.*
- *After retry control, the condition of monitoring is continued for 30 minutes.*
- *The maximum value (*1) and (*2) are as follows:*
- *(*1)*

Main power	220-240V		380-415V
HP	3	5	10
Current (A)	16.0	24.0	20.0

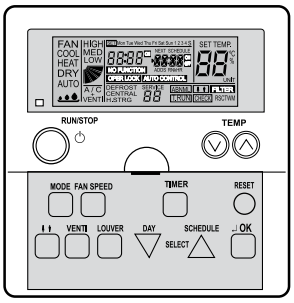
- *(*2)*

	HP / Demand setting	220 – 240V	220 – 240V	
		10	3	5
Current (A)	100%	11.0	13	17.0
	75%	8.0	10	13.0
	50%	5.0	6.5	8.5

7.3. Procedure for checking each main part

7.3.1. Self-checking procedure of PCB using the remote control switch

Use the following troubleshooting procedure for testing the PCB in the indoor unit and the outdoor unit:



Stop operation

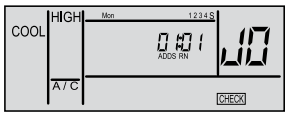
☛ Press RUN/STOP

PCB check mode

☛ Press both switches for three seconds TEMP OK

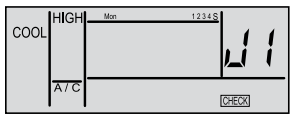
(ex.) Indication of unit No. "0"

Indication of unit number



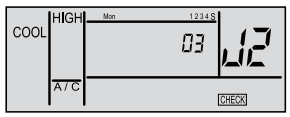
After 7 seconds

Operating automatic PCB check



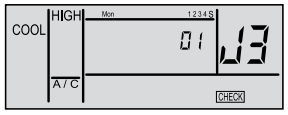
After approx. 5 seconds (max. 30 seconds in case of a transmission failure between the indoor unit and the outdoor unit).
Max. three types of abnormal operations indicated.

Abnormal operation (1)



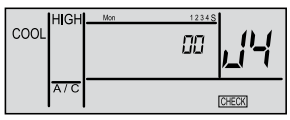
After 1 second

Abnormal operation (2)



After 1 second

Abnormal operation (3)



After 1 second

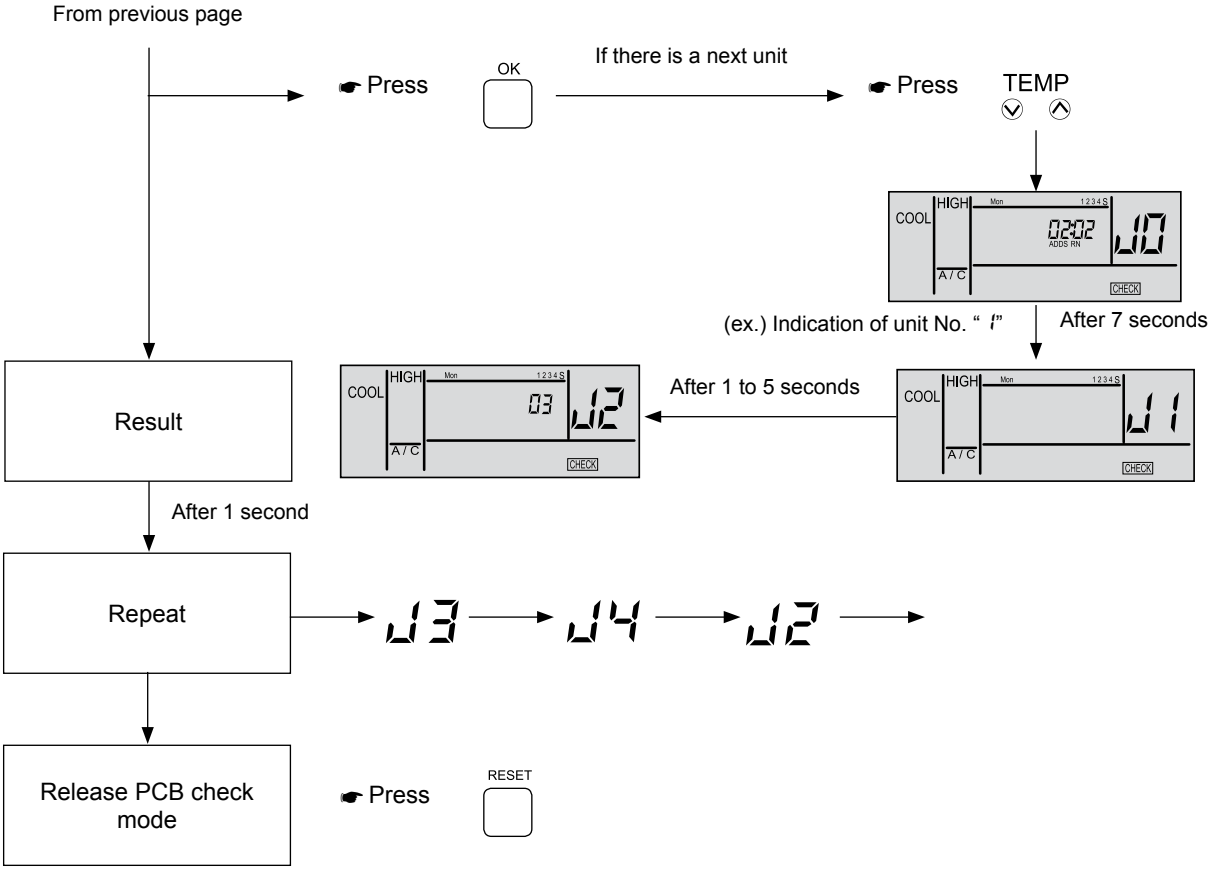
To next page

Indication	Contents	
00	Normal	
Abnormality (open-circuit, short-circuit, etc.) in circuit for:		
01	Air inlet temp. thermistor	Indoor unit PCB
02	Discharge air. temp. thermistor	
03	Liquid pipe temp. thermistor	
04	Remote thermistor abnormality	
05	Gas pipe temp. thermistor	
06	Remote sensor	
08	Transmission of central station	
0A	EEPROM	
0b	Zero cross input failure	
EE	Transmission of indoor units during this checking operation	
07	Transmission of outdoor unit	Outdoor unit PCB
F4	Internal thermostat fan input failure	
F5	PSW input failure	
F6	PSH protection signal detection circuit	
F7	Phase detection	
F8	Transmission of inverter	
FA	High-pressure sensor	
Fb	Comp. discharge gas temp. thermistor	
FC	Low-pressure sensor	
Fd	Heat exchanger evaporation temp. thermistor	
FF	Ambient air temp. thermistor	

If you are using a wireless remote control switch with the built-in receiver part of the wall-type indoor unit and you need to perform the above checking, perform the following procedure:

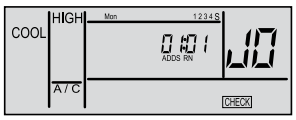
1. Turn OFF the power supply.
2. Disconnect the connector (CN25) on PWB(M).
3. Connect the PC-ART.
4. Turn ON the power supply.

After finishing the checking, turn OFF the power supply again and reconnect the connectors according to the previous situation before the checking.



NOTE

- *If this indication continues and the alarm code "U 1" is not displayed, this means that each one of indoor unit is not connected to the remote control switch.*
  Check the wiring between the remote control switch and the indoor unit.

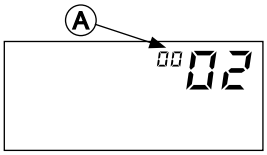


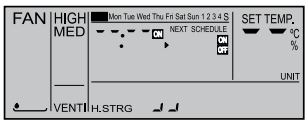
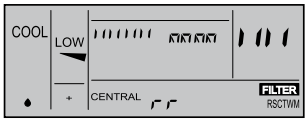
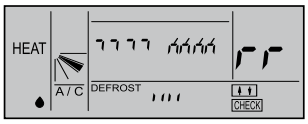
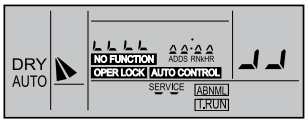
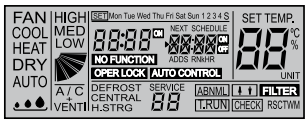
- *In this troubleshooting procedure, checking of the following parts of the PCB is not available.*
  PCB in indoor unit: relay circuit, DIP switch, option circuit, fan circuit, protection circuit.
  PCB in outdoor unit: relay circuit, DIP switch, option circuit.
- *If this troubleshooting is performed in the system using the central station, the indication of the central station may change during this procedure. However, this is not abnormal.*
- *After this troubleshooting, the memory of the abnormal operation occurrence counter, which was described before, will be deleted.*

7.3.2. Self-checking procedure of the Remote Control Switch

Cases where the CHECK switch is used:

1. If the remote control switch displays a malfunction.
2. For the regular maintenance check.

1	Turn ON the power source
2	Simultaneously press the following three switches. (During the operation, you can press the switches.) TEMP (▽ △) MODE (□)
3	The LCD changes as shown in the right figure.
4	After the LCD changes as shown in the right figure, the RUN indicator flickers twice.
5	The LCD changes as shown below. Press all the switches (13 switches) one by one. Every time you press the switch, the number of the indication of the part (A) in the figure below increases one. 
6	The LCD changes as shown below. The remote control switch automatically starts to check the transmission circuit

No.	LCD indication	Indicating period (sec.)
1		1
2		1
3		1
4		1
5		3

Only for the cancellation of EEPROM, press the following three switches simultaneously during the changes of the LCD.

TEMP (▽ △) MODE (□)

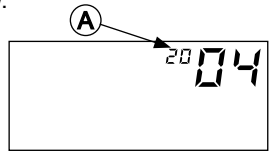
To 11

NOTE

- *Unless all the switches are pressed, the checking does not proceed to the next item.*
- *You can press the switches in any order.*
- *Pressing two or more switches simultaneously is invalid and not counted.*

NOTE

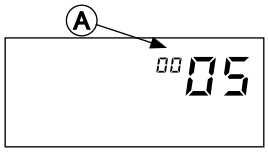
- *In case that the transmission circuit is abnormal, the LCD remains as shown in the left figure and the checking does not proceed to the next item.*

7	The LCD changes as shown below. The detected temperature of the remote control thermostat is displayed at the (A) part in the figure below. 

→ If the indicators "- -" or "FF" are displayed at the "A" part, the remote control thermostat is abnormal.

8	The LCD changes as shown below.

→ If you press the RESET switch or you leave the switches for 15 seconds, the data of EEPROM (storage cell inside of the remote control switch) is cleared. At this time, the number is displayed at the (A) part, which is shown in the figure below. When the number "99" is displayed, EEPROM is abnormal.



9	The LCD changes as shown below. After several seconds have passed, the remote control switch is automatically activated again.

← If the number which is displayed at the (A) part is "99", the checking does not proceed to the next item.

10	When the remote control switch is activated again, the RUN indicator is ON and the operation is started. Therefore, press the RUN/STOP switch and stop the operation.

→

NOTE
- *In case that the operation is not automatically started when the remote control switch is activated again, the detection circuit for the momentary stoppage may be abnormal. However, the detection circuit will not interfere with the normal operation.*
- *There is a case where the operation is automatically stopped after the automatic operation when the remote control switch is activated again.*

Cancellation of EEPROM
(from step 3)

11	The LCD changes as shown below and the remote control switch automatically cancels the EEPROM.

12	The LCD changes as shown below After several seconds have passed, the remote control switch is automatically activated again. In this case, the operation is not started automatically.

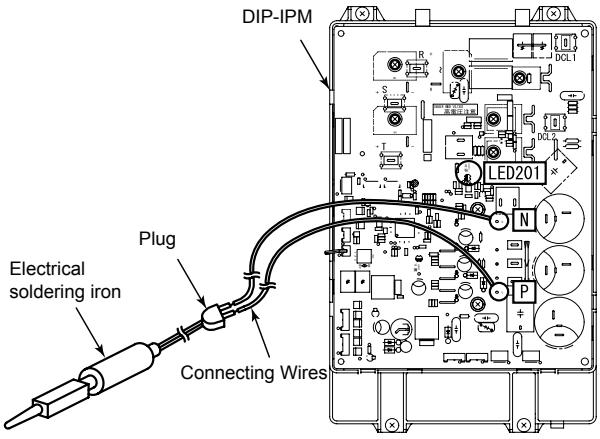
7.3.3. Checking procedure of other main parts

- **RASC-(3/5)HVRNE. Procedure for checking the DIP-IPM.**

High voltage discharge is an imperative work for replacing parts.

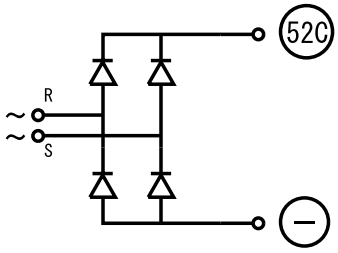
	WARNING
- *Electrical hazard. Can cause serious injuries. Perform the high voltage discharge procedure as described.*	

1. Turn OFF the main switches and wait for three minutes. Make sure that no high voltage exists. If LED201 is ON after start-up and LED201 is OFF after turning OFF power source, the voltage will decrease lower than DC50V.
2. Connect connecting wires to an electrical soldering iron
3. Connect the wires to terminals, P and N on DIP-IPM. => Discharging is started, resulting in hot soldering iron. Pay attention not to short-circuit between terminal P(+) and N(-)
4. Wait for 2 or 3 minutes and measure the voltage once again. Check to ensure that no voltage is charged.



- **Inverter module checking procedure**

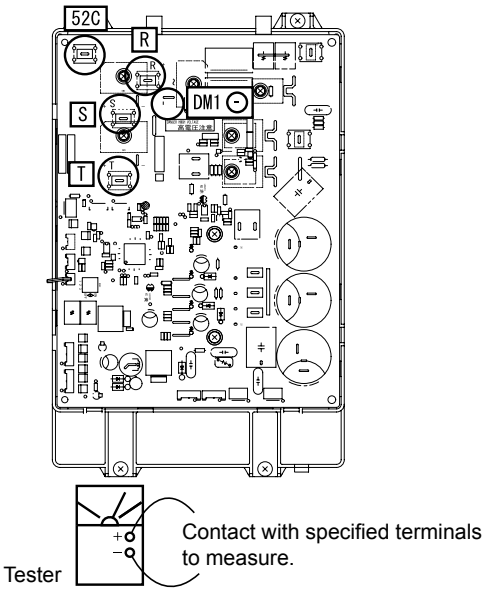
Internal circuit of rectified part of DIP-IPM



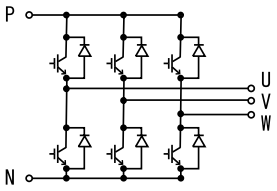
Non-faulty if [1] – [8] are checked and satisfied. (Measure with 1 kΩ range of a tester.)

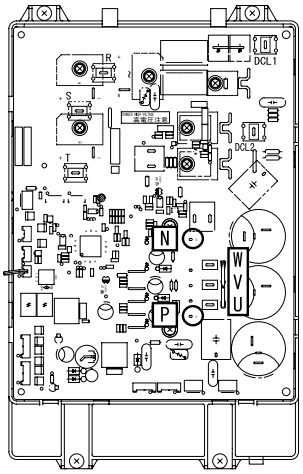
	NOTE
- *DO NOT use a digital tester.*	

1. Touch [+] of the tester to DIP-IPM 52C terminal, and [-] to DIP-IPM R, S terminals to measure the resistance. Normal if all three terminals have 1 kΩ or greater.
2. Contrary to [1], touch [-] of the tester to DIP-IPM 52C terminal, and [+] to DIP-IPM R, S terminals to measure the resistance. Normal if all three terminals have 100 kΩ or greater.
3. Touch [-] of the tester to [-] of DIP-IPM DMI (soldered part), and [+] of the tester to DIP-IPM R, S terminals to measure the resistance. Normal if all three terminals have 1 kΩ or greater
4. Contrary to [3], touch [+] of the tester to [-] of DIP-IPM DMI, and [-] of the tester to DIP-IPM R, S terminals to measure the resistance. Normal if all three terminals have 100 kΩ or greater.



5. Touch [+] of the tester to [P] of DIP-IPM (soldered part), and [-] to DIP-IPM U, V, W terminals to measure the resistance.
   Normal if all three terminals have 1 kΩ or greater.
6. Contrary to [5], touch [-] of the tester to [P] of DIP-IPM (soldered part), and [+] to DIP-IPM U, V, W terminals to measure the resistance.
   Normal if all three terminals have 30 kΩ or greater.
   (Resistance gradually increases during measurement.)
7. Touch [-] of the tester to [N] of ISPM (soldered part), and [+] to ISPM U, V, W terminals to measure the resistance.
   Normal if all three terminals have 1 kΩ or greater.
8. Contrary to [7], touch [+] of the tester to [N] ofDIP-IPM (soldered part), and [-] to DIP-IPM U, V, W terminals to measure the resistance.
   Normal if all three terminals have 30 kΩ or greater.
   (Resistance gradually increases during measurement.)

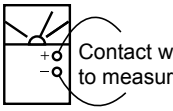




Internal circuit of ACT part of inverter module

Non-faulty if [9] – [13] are checked and satisfied.

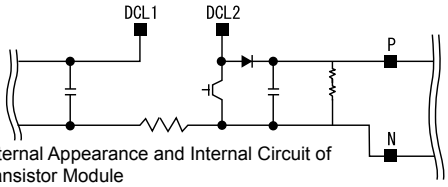
(Measure with 1 kΩ range of a tester.)



Tester

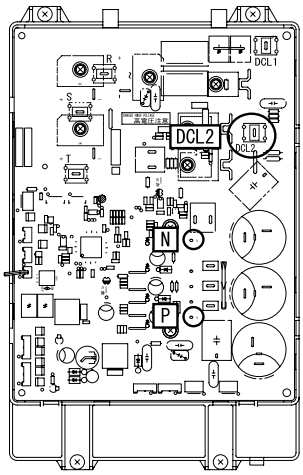
Contact with specified terminals to measure.

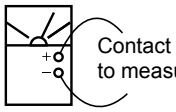
	NOTE
- *DO NOT use a digital tester*	



External Appearance and Internal Circuit of Transistor Module

9. Check items [1] – [8].
10. Touch [+] of the tester to DIP-IPM DCL2 terminal, and [-] to [P] of ISPM/DIP-IPM (soldered part) to measure the resistance.
    Normal if all three terminals have 100 kΩ or greater
11. Contrary to [10], touch [-] of the tester to DIP-IPM DCL2 terminal, and [+] to [P] of DIP-IPM (soldered part) to measure the resistance.
    Normal if all three terminals have 1 kΩ or greater.
12. Touch [+] of the tester to DIP-IPM DCL2 terminal, and [-] to [N] of DIP-IPM (soldered part) to measure the resistance.
    Normal if all three terminals have 100 kΩ or greater.
13. Contrary to [12], touch [-] of the tester to DIP-IPM DCL2 terminal, and [+] to [N] of DIP-IPM (soldered part) to measure the resistance.
    Normal if all three terminals have 10 kΩ or greater.
    (Resistance gradually increases during measurement.)





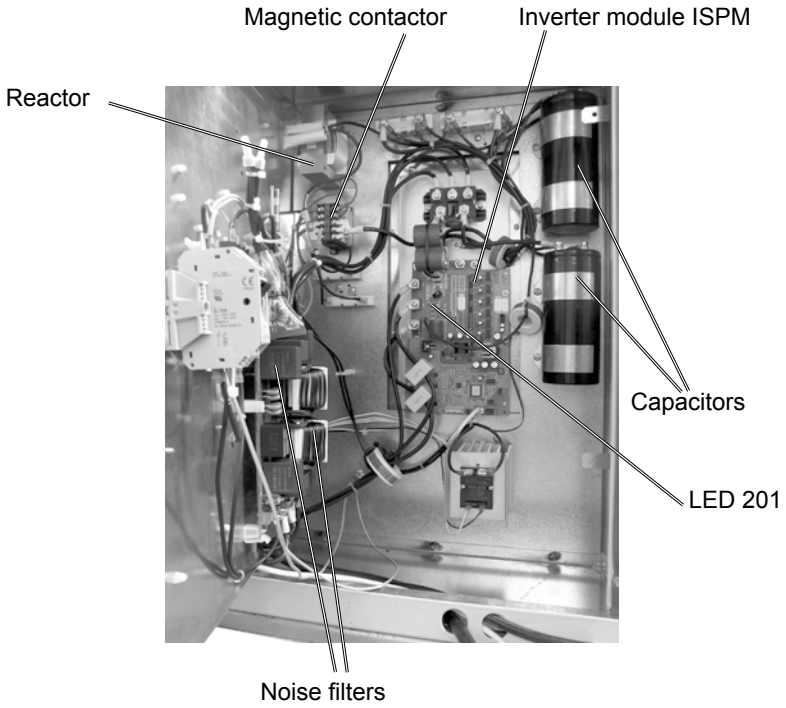
Tester

Contact with specified terminals to measure.

- **RASC-10HRNE. Procedure for checking the ISPM.**

Remove all the terminals of the ISPM before check. If items (a) to (h) are performed and the results are satisfactory, ISPM is normal. Measure it under 1 kΩ range of a tester.

⚠	***CAUTION***
- *Electrical hazard. Can cause serious injuries. Perform the high voltage discharge procedure as described.*	

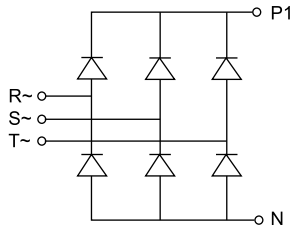


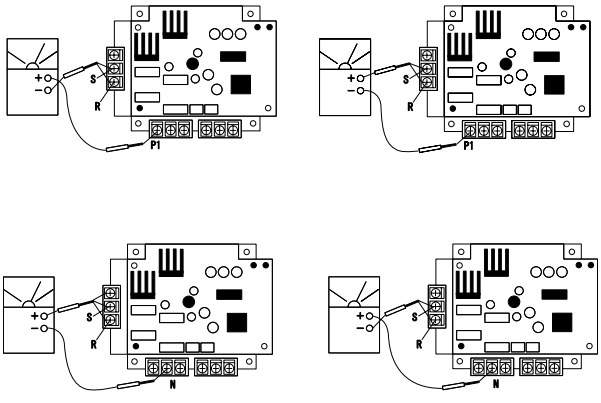
- Procedure using an analog tester:

Checking the diode module:

1. By touching the + side of the tester to the P1 terminal of ISPM and the - side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.
2. By touching the - side of the tester to the P1 terminal of ISPM and the + side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.
3. By touching the - side of the tester to the N terminal of ISPM and the + side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.
4. By touching the + side of the tester to the N terminal of ISPM and the - side of the tester to R and S of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.

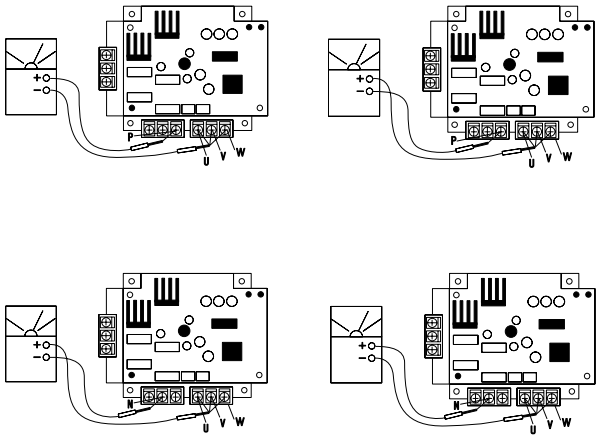
Rectification parts of internal circuit of ISPM (common)





Checking the transistor module:

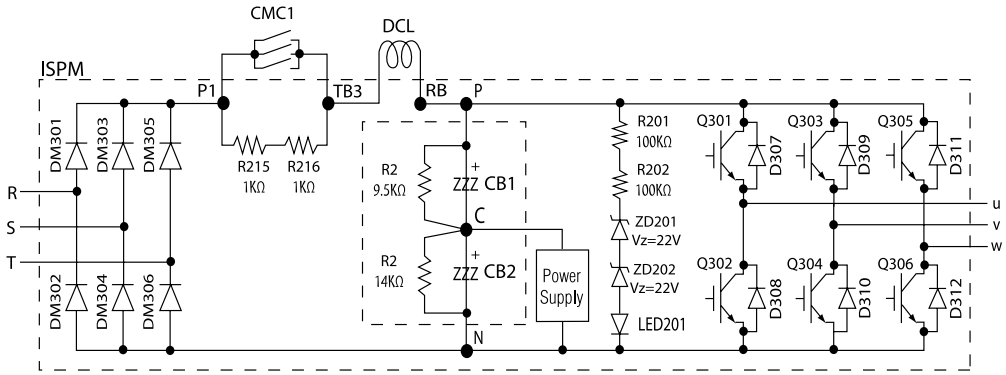
1. By touching the + side of the tester to the P terminal of ISPM and the - side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.
2. By touching the - side of the tester to the P terminal of ISPM and the + side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.
3. By touching the - side of the tester to the N terminal of ISPM and the + side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 100 kΩ, it is normal.
4. By touching the + side of the tester to the N terminal of ISPM and the - side of the tester to U, V and W of ISPM, measure the resistance. If all the resistances are more than 1 kΩ, it is normal.



- Procedure using a digital tester:

	NOTE
-	*The digital tester must be able to check semiconductors and continuity.*

Based on the folowing scheme of ISPM with the contactor, the reactor, capacitors and the resistance, follow the next procedures.



- **Checking the diode module**

1. By placing a jumper from +P1 to -RST or -N to +RST, no continuity and no variation on voltage drop should appear.

2. By placing a jumper from P1 to +RST or +N to RST: continuity and variation on voltage drop (nearly 0,365) should be displayed, and the same value in all cases. Not the same value means that the diode module is damaged.

- **Checking the transistor module**

1. By bonding +P to -UVW or -N to +UVW, no continuity and no variation on voltage drop should appear.

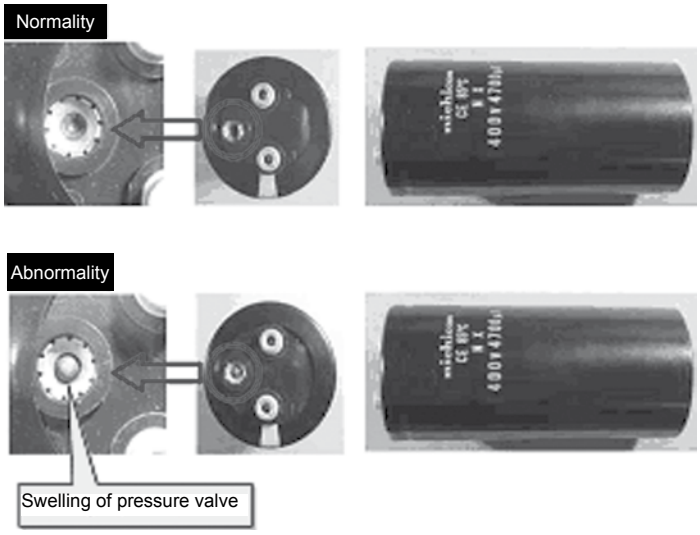
2. By bonding -P to +UVW or +N to -UVW: continuity and variation on voltage drop (nearly 0,405) should be displayed, and the same value in all cases. Not the same value means that the diode module is damaged.

- **Checking capacitors CB1 & CB2.**

	DANGER
	- *Electical hazard. Can cause serious injuries or death.* - *Before installing the electrical wiring or before performing a periodical check, turn OFF the main switch of the unit.* - *Turn off the unit and wait for the LED 201 to be off before touching the components.* - *Prevent from touching the capacitors' terminals. High voltage should be present before discharging them.*

If it's possible, check the capacitance of each capacitor : 4700µF ± 20% (between 3760µF to 5640µF).

A visual check of the pressure valve of capacitors must be done to ensure it's integrity:



It is not recommended to check tension.

PN = Power source x √2, PC=CN is nearly equal to PN/2.

R1 & R2:

1) If the value is different:

- Capacitor could be damaged by overload.

- 04 alarm could be displayed if low supply voltage (CN) for ISPM control part is present.

2) R1 = 9.5Ω & R2 = 14.0Ω. If these values are different, the capacitors will be not properly charged.

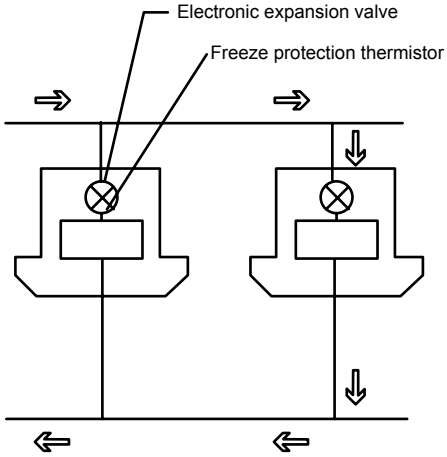
Resistance between P1 & TB3 = 2kΩ (white resistance in the ISPM).

In case that Mg. SW 52C (CMC1) is not ON, the compressor current will travel through these resistances, and they will be broken. Mg. SW 52C (CMC1) should be checked. Check the resistance between the primary and secondary terminal where the contact point is melted for Mg. SW 42C. If there is continuity, the contact is melted and 52C is broken (NG).

Reactor resistance can be messured between TB3 and RB = 0,2Ω. Checking this component is not necessary.

	NOTE
- *Noise filter does not affect ISPM directly, so is not necessary to check it when ISPM fails.* - *Both digital or analog testers are valid to check the values.*	

- **Checking procedure for the electronic expansion valve**

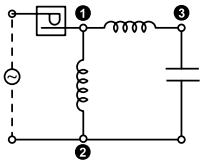
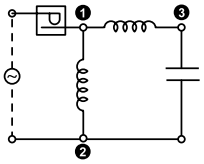
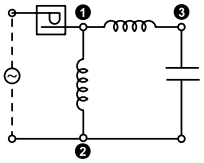
	Indoor unit electronic expansion valve	**Outdoor unit electronic expansion valve**
Locked with fully closed	Check the liquid pipe temperature during the heating process. It is abnormal if the temperature does not increase.	It is abnormal if the liquid pipe pressure does not increase during the cooling process.
Locked with slightly open	It is abnormal under the following condition: the temperature of the freeze protection thermistor becomes lower than the suction air temperature when the unit which is under chechink stops and the other units are under the cooling process.	It is abnormal if the liquid pipe pressure does not increase and the outlet temperature of the expansion valve decreases after the cooling process starts.
Locked with fully open		It is abnormal under the following conditions: after the heating process for more than 30 minutes, the discharge gas temperature of the compressor is not 10°C higher than the condensing temperature and there is no other faults, such as an excessive charge of refrigerant and others.

- **Checking procedure for the electrical coil parts**

Abbreviations used for colors:

Black	Brown	Red	Yellow	Green	Blue	Grey	Orange	White
BLK	BRN	RED	YEL	GRN	BLU	GRY	ORN	WHT

Fan motor of the outdoor units

Outdoor units	Power consumption	Electrical wiring diagram	Wiring No.	Resistance (Ω)
RASC-3HVRNE	350 W		BLU ❶-❷ BLK BLU ❶-❸ BRN	8,67 ± 7% 10,50 ± 7%
RASC-5HVRNE	950 W		BLU ❶-❷ BLK BLU ❶-❸ BRN	3,47 ± 7% 5,99 ± 7%
RASC-10HRNE	1500 W		BLK❶-❷WHT BLK❶-❸RED	2,26 ± 7% 7,20 ± 7%

7

- **Other parts**

Part name	Unit models	Model code	Resistance (Ω)
Solenoid valve of gas bypass (3/8)	RASC-(3/5)HVRNE	105-52-52 (50Hz)	1540.00 at 20 ºC
		105-52-51 (60Hz)	1250.00 at 20 ºC
Solenoid valve of gas bypass (1/4)		VPV-MOAJ502B1 (50Hz)	1435.00 at 20ºC
		VPV-MOAG579A1 (60Hz)	952.00 at 20ºC
Reversing valve		STF-01AJ502D1 (50Hz)	1435.00 at 20ºC
		STF-01AI511A1 (60Hz)	1358.00 at 20ºC
Compressor motor		E655DHD-65D2 (380-415V)	0.839 at 20ºC
		E655DHD-65A2 (220V)	0.199 at 20ºC

Part name	Unit models	Model code	Resistance (Ω)
Solenoid valve of gas bypass (3/8)	RASC-10HRNE	105-52-52 (50Hz)	1540.00 at 20 ºC
		105-52-51 (60Hz)	1250.00 at 20 ºC
Solenoid valve of gas bypass (1/4)		VPV-MOAJ502B1 (50Hz)	1435.00 at 20ºC
		VPV-MOAG579A1 (60Hz)	952.00 at 20ºC
Reversing valve		STF-01AJ502D1 (50Hz)	1435.00 at 20ºC
		STF-01AI511A1 (60Hz)	1358.00 at 20ºC
Compressor motor		E655DHD-65D2 (380-415V)	0.839 at 20ºC
		E655DHD-65A2 (220V)	0.199 at 20ºC

- **Checking procedure for the compressor**

CHECK LIST ON COMPRESSOR

Client:	**Model:**	**Date:**
Serial No.	**Production date:**	**Checker:**

No.	Check item	Check method	Result	Remarks
1	Is THM9 correctly connected? THM9: discharge gas thermistor	1. Is wire of thermistor correctly connected by viewing? 2. Check to ensure the 7-segment indication of Td when comp. is operating. Td: temperature of THM9		
2	Is thermistor THM9 disconnected?	1. Check to ensure that thermistor on the top of comp. is correctly mounted by viewing? 2. Check to ensure that actually measured temp. is the same as the indication during check mode.		
3	Is current sensor faulty?	1. Check to ensure that indication A1 and A2 are 0 during compressor stopping. 2. Check to ensure that indication A1 and A2 are not 0 during compressor running.		
4	Is current sensing part on PCB2 faulty?			
5	Is the direction of current sensor CTU, CTV) reverse?	Check the direction => by viewing.		
6	Are power source wires, U and V inserted correctly into current sensor? .	Check to ensure that wires are correctly inserted		
7	Is exp. valve (MV1) correctly connected?	Check to ensure that MV1 to CN5A is correctly connected		
8	Is exp. valve coil (MV1) correctly connected?	Check to ensure that each coil is correctly mounted on the valve.		
9	Are the refrigeration cycle and electrical wiring system incorrectly connected?	Check to ensure that refrigerant is flowing into indoor units by operating one refrigerating cycle only from the outdoor unit.		
10	Is opening of exp. valve completely closed (locked)?	Check the following by the check mode of outdoor units. 1. Liquid pipe temp. (TL) < air intake temp. (Ti) during cooling operation 2. Liquid pipe temp. (TL) > air intake temp. (Ti) during heating operation		
11	Is opening of exp. valve fully opened locked)?	Check to ensure that liquid pipe temp. is lower than air intake temp. of stopping indoor unit when other indoor units are operating under cooling operation.		
12	Are the contacts for comp. magnetic switch CMC1 faulty?	Check the surface of each contact (L1, L2 and L3) by viewing.		
13	Is there any voltage abnormality among L1-L2, L2-L3 and L3-L1?	Check to ensure that voltage imbalance is smaller than 3%. Please note that power source voltage must be within 380V or 220V+10%.		
14	Is the comp. oil acidified during compressor motor burning?	Check to ensure that the oil color is not black.		

Additional Information for "CHECK LIST ON COMPRESSOR"

Check item	Additional information (mechanism of the compressor failure)
1 & 2	The liquid refrigerant return volume to the compressor is controlled by the discharge gas temperature Td when compressor is operating. If Td thermistor is disconnected, the liquid refrigerant return volume will become small by detecting the temperature even if the actual discharge gas temperature is high. Therefore, this abnormal overheating by detecting the temperature operation will result in insulation failure of the motor winding.
3 & 4	Overcurrent control (operating frequency control) is performed by detecting current by the PCB2. In this case, winding insulation failure will occur, since control is not available in spite of actually high current.
5 & 6	The current sensor checks phase and adjusts output electrical wave in addition to the above mentioned items. If fault occurs, the output electrical wave becomes unstable giving stress to the motor winding, resulting in winding insulation failure.
7 &8	During a cooling operation, SH is controlled by MV of each indoor units. During a heating operation, Td is controlled by MV1. If expansion valves are incorrectly connected, correct control is not available, resulting in compressor seizure depending on liquid refrigerant returning conditions or motor winding insulation failure depending on overheating conditions.
9	If the refrigeration cycle and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
10	If the expansion valve and electrical system are incorrectly connected, abnormally low suction pressure operation is maintained or abnormally high discharge pressure operation is maintained, resulting in giving stress to the compressor, since their correct control is not available.
11	The compressor may be locked due to the liquid return operation during the cooling operation.
12	In the case that the contacting resistance becomes big, voltage imbalance among each phase will cause abnormal overcurrent.
13	In this case, overcurrent will occur, efficiency will decrease or the motor winding will be excessively heated.
14	In the case, it will result in motor burning or compressor seizure.

8. Spare Parts

Contents

8. Spare parts 201

8.1. RASC-(3/5)HVRNE 202

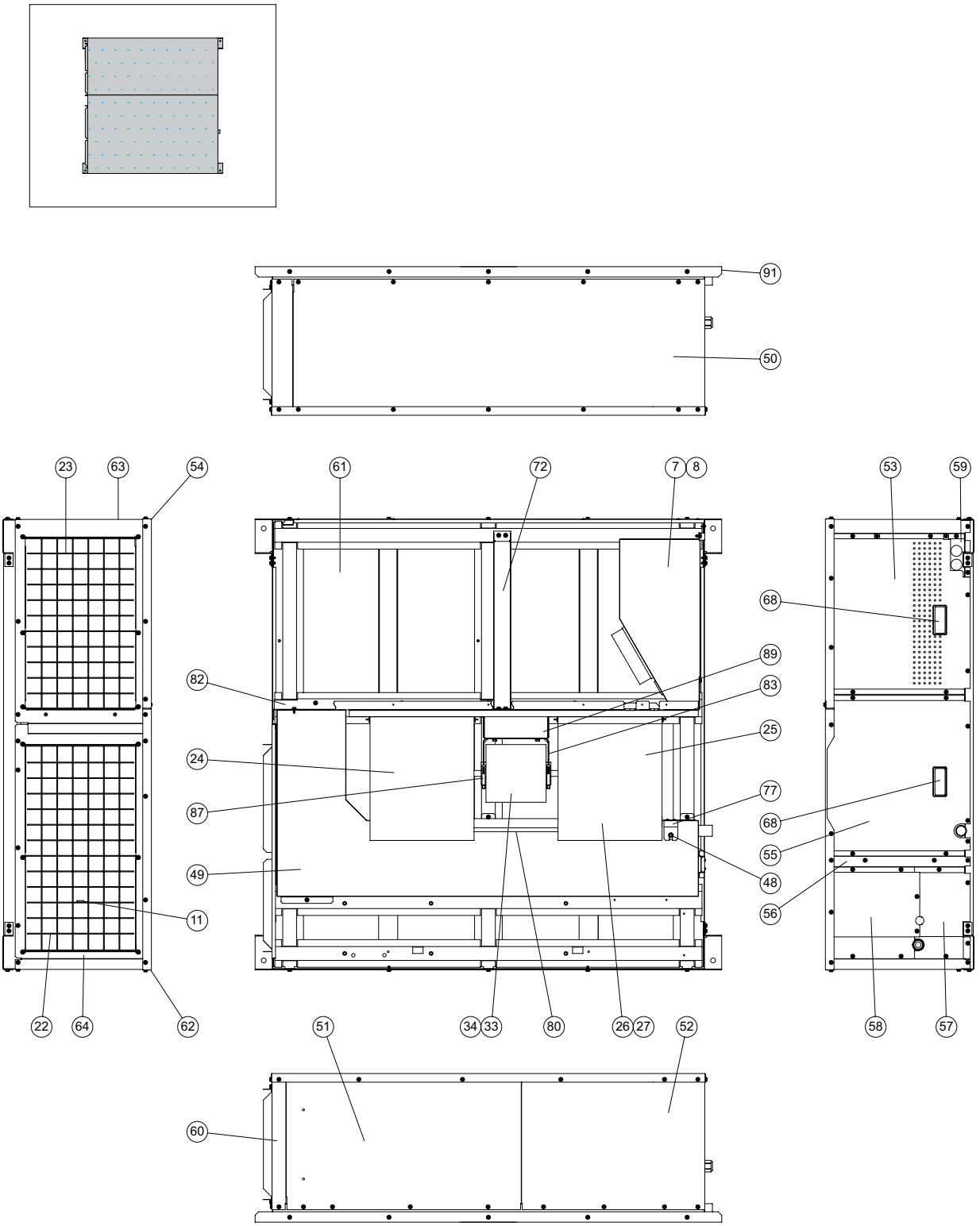
8.1.1. Cabinet and Fan 202
8.1.2. Refrigerant Cycle 204
8.1.3. Electrical equipament 206

8.2. RASC-10HRNE 208

8.2.1. Cabinet and Fan 208
8.2.2. Refrigerant Cycle 210
8.2.3. Electrical equipment 212

8.1. RASC-(3/5)HVRNE

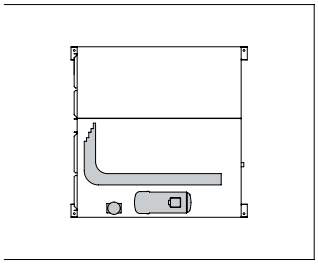
8.1.1. Cabinet and Fan

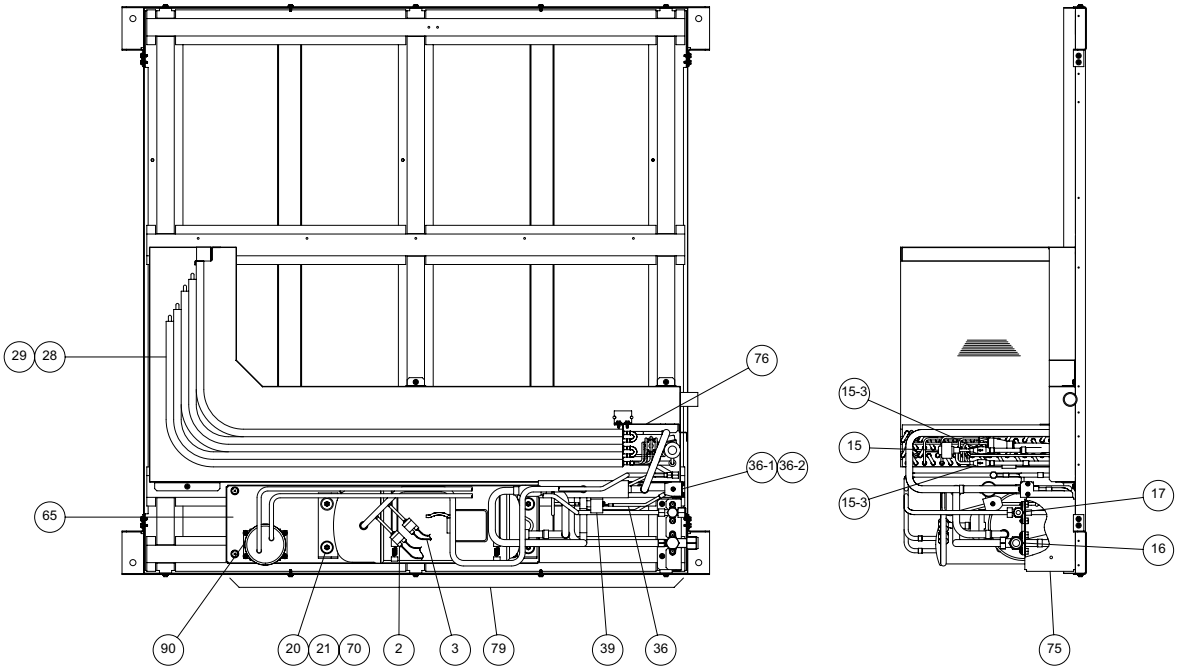


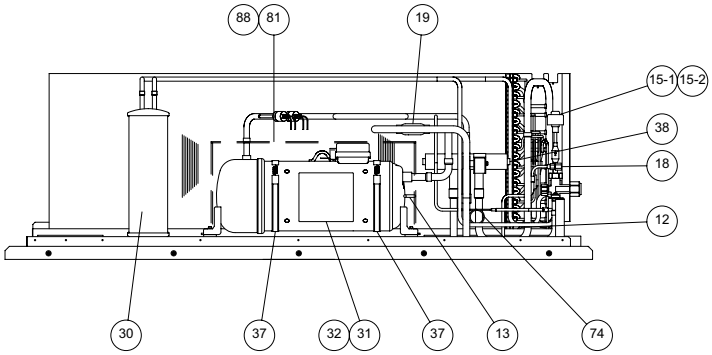
Drawing Nº: EPN200809

		PRODUCT CODE	7E340005	7E340008	
		MODEL NAME	RASC-3HVRNE, 1N~ 230V 50Hz	RASC-5HVRNE, 1N~ 230V 50Hz	
No.	**Description**	**PART No.**	**Qty**	**Qty**	**Remarks**
1	Terminal Board	E01818	1	1	
2	Harness PS	E01958	1	1	PSH (Pressure Switch High)
3	Harness PSC	E01959	1	1	PSC (Pressure Switch Control)
4	Fuse	P24776	1		40A
5	Fuse	P24728		1	50A
6	Fuse	E01960	1	1	10A
7	Electrical Wiring Diagram	E01961		1	Assembly (Components + Harness + Steel Plates)
8	Electrical Wiring Diagram	E01962	1		Assembly (Components + Harness + Steel Plates)
9	Capacitor	P20444	1		18µF
10	Capacitor	P22531		1	30µF
11	Thermistor	P22520	1	1	TA
12	Thermistor	P23507	1	1	TE
13	Thermistor	P22573	1	1	TD
14	Noise Filter	P26446	1	1	
15	EVO Assy	E01963	1	1	
15-1	Expansion Valve	P24691	1	1	
15-2	EXPV Coil	P24655	1	1	
15-3	Strainer	P25037	2	2	
16	S Valve 5/8	E01964	1	1	Gas Line
17	S Valve 3/8	E01525	1	1	Liquid Line
18	Check JA	P25044	1	1	
19	Strainer	P24398	1	1	
20	V-P-Rubber 1	P17308	4	4	
21	V-P-Rubber 2	P13109	4	4	
22	Protector Net 1	E01965	1	1	Inlet
23	Protector Net 2	E01966	1	1	Outlet
24	Fan Assy. L	E01846	1	1	Fan Casing + Runner (left)
25	Fan Assy. R	E01843	1	1	Fan Casing + Runner (right)
26	Fan Unit	E01967		1	Assembly
27	Fan Unit	E01968	1		Assembly
28	Condenser	E01969		1	Assembly
29	Condenser	E01970	1		Assembly
30	L Tank	E01971	1	1	Assembly
31	Compressor	E01972	1		E305ALD-27A2
32	Compressor	E01973		1	E405ALD-36A2
33	Fan Motor	E01974		1	DC 950W, 4P
34	Fan Motor	E01975	1		DC 350W, 4P
35	MG SW	P24721	1	1	
36	SV Assy	E01976	1	1	
36-1	Body	P25246	1	1	Solenoid Valve
36-2	Coil Harness 20	E02017	1	1	SVA (Solenoid Valve Coil)
37	C-Heater	E01977	2	2	
38	4 Way Valve	P26337	1	1	Reversing Valve

8.1.2. Refrigerant Cycle



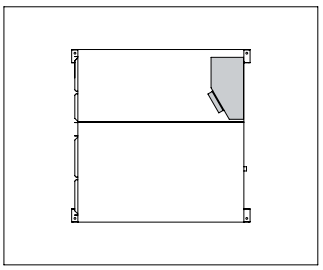


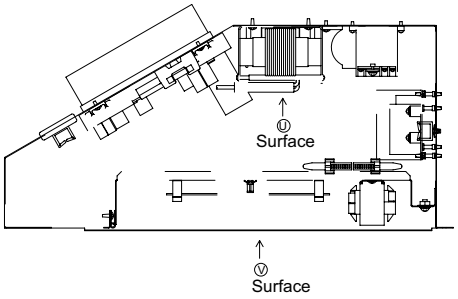


Drawing Nº: EPN200809

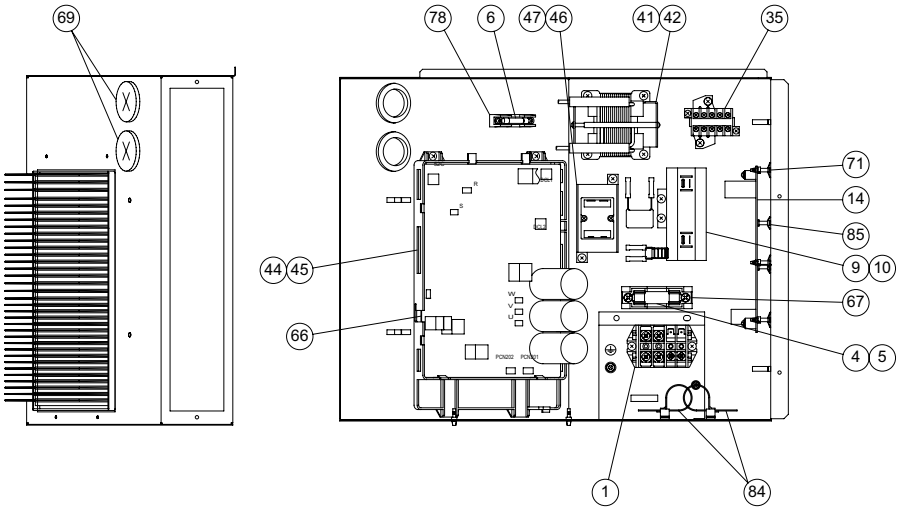
No.	Description	Remarks
39	Coil Harness 21	RVR (Reversing Valve Coil)
40	Transformer	TF
41	Reactor	DCL
42	Reactor	DCL
43	Printed Circuit Board	Main (PO052 Assy)
44	Inv. Fin Assy	DIP IPM 25A (PV051 Assy)
45	Inv. Fin Assy	DIP IPM 17A (PV051 Assy)
46	SSR	
47	Radiation Fin	
48	Float Switch	
49	Drain Pan Unit	
50	Side Cover 1 Assy	Assembly
51	Side Cover 3 Assy	Assembly
52	Side Cover 2 Assy	Assembly
53	E-Box Cover Assy	Assembly
54	U Cover 2 Unit	Assembly
55	Fan Cover Unit	Assembly
56	Side Stay Cover Assy	Assembly
57	Valve Cover 1 Assy	Assembly
58	Valve Cover 2 Assy	Assembly
59	Wiring Cover	
60	Corner Cover Assy	Assembly
61	B-Base Assy	Assembly
62	U Cover 1 Assy	Assembly
63	Suction Cover 1 Assy	Assembly
64	D-Cover Assy	Assembly
65	Comp Base	
66	Thermistor	For Inverter
67	Fuse Holder	
68	Handle	
69	Rubber Bushing	
70	Special Nut	
71	Spacer KGPS	
72	Fan Partition Plate	
73	Holder	
74	Capillary Assy	
75	SV Stay	
76	Side Partition Plate	
77	FS Stay	
78	Fuse Holder	
79	Pipe Assy	
80	Casings Stay	

8.1.3. Electrical equipament

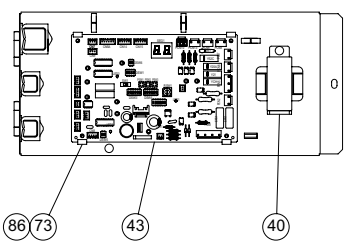




Ⓤ Surface



Ⓥ Surface

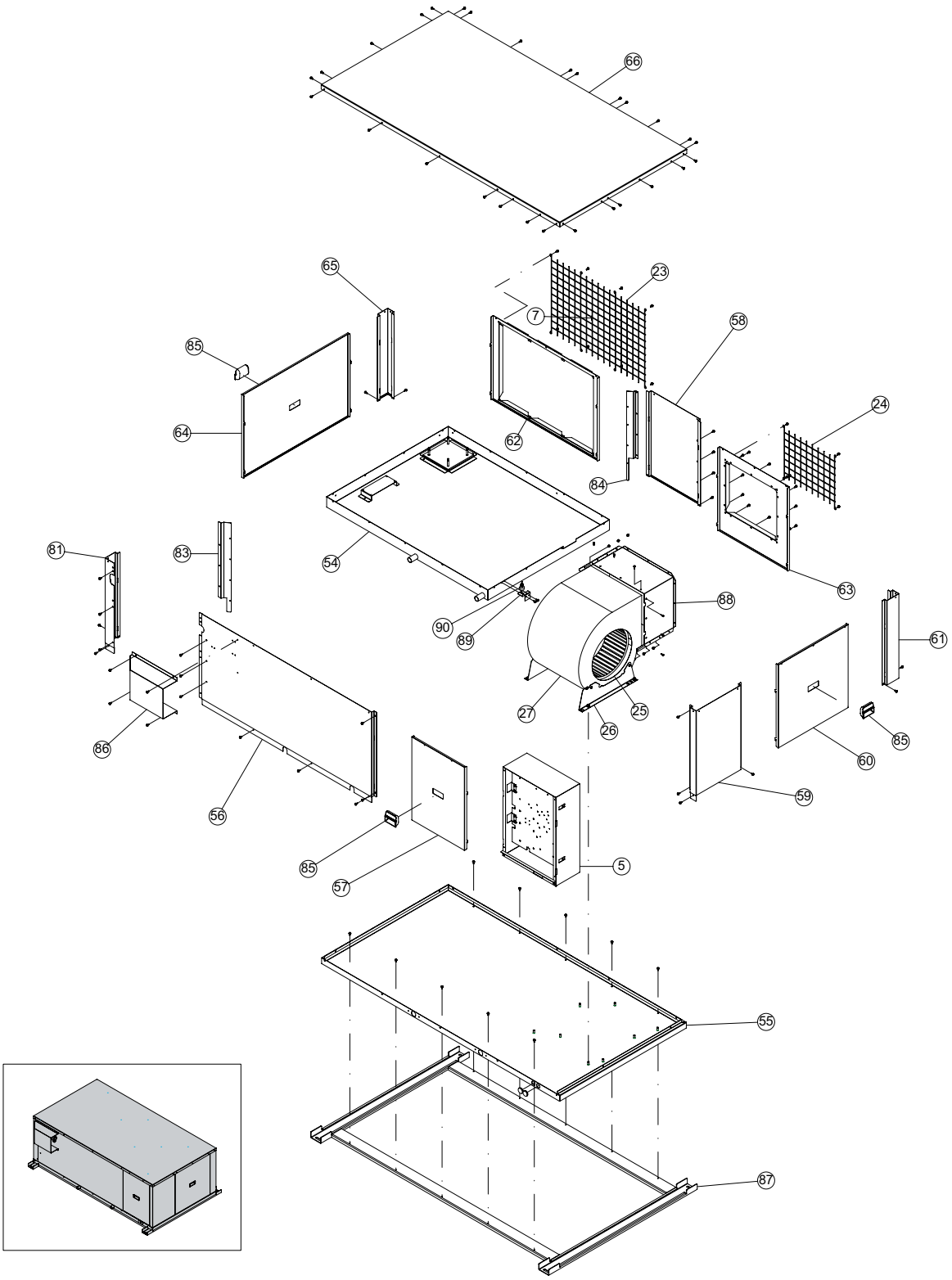


Drawing Nº: EPN200809

No.	Description	Remarks
82	Fan Partition Assy	
83	Motor Base	
84	Clamp	
85	Spacer	
86	Push Spacer	
87	Bracket	
88	Acoustical Cover 2	
89	Fan Stay Assy	Assembly
90	L Base	
91	Suspension Base	

8.2. RASC-10HRNE

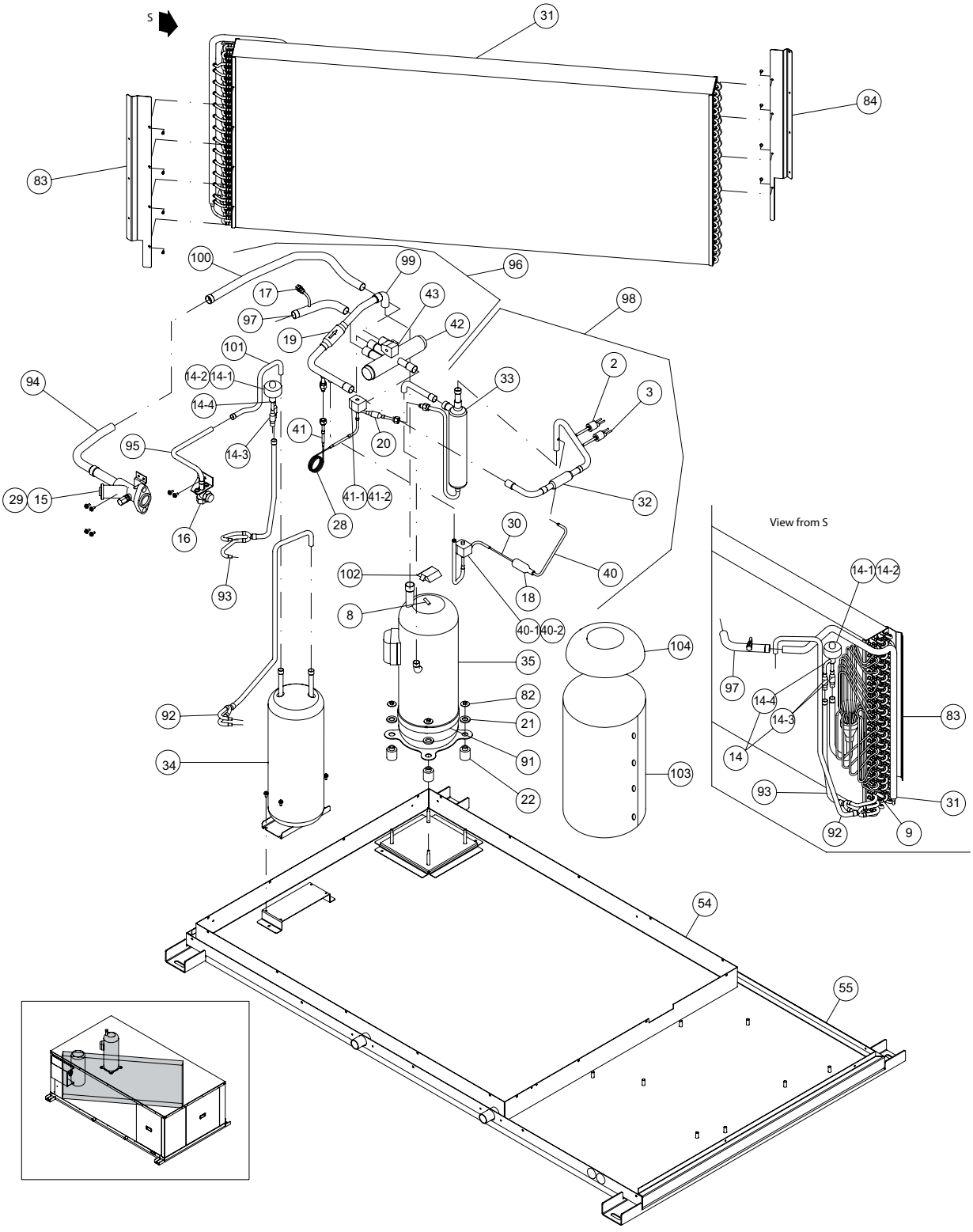
8.2.1. Cabinet and Fan



Drawing Nº: EPN200809

No.	Description	Remarks
1	Terminal Board	
2	Cord PS	PSH (Pressure Switch High)
3	Harness PS	PSC (Pressure Switch Control)
4	Fuse	40A
5	Electrical Wiring Diagram	Assembly (Components + Harness + Steel Plates)
6	Capacitor	4700μF
7	Thermistor	TA
8	Thermistor	TD
9	Thermistor	TE
10	Noise Filter	
11	Noise Filter	
12	Transistor M	For Inverter
13	Diode M	For Inverter
14	Exp. Valve Unit	
14-1	EXPV Coil	
14-2	Exp. Valve	
14-3	Strainer	
14-4	Exp. Valve Cord	
15	S Valve 1/1	Gas Line
16	S Valve 1/2	Liquid Line
17	Check JA	
18	Dist. Strainer	
19	Strainer	
20	Strainer	
21	V-P-Rubber 2	
22	V-P-Rubber 1	
23	Inlet Protector Net	Inlet
24	Outlet Protector Net	Oulet
25	Fan Motor Unit	Assembly
26	Fan Unit Feet	
27	Fan Motor	DC 1500W - 6P (Fan Casing + Runner)
28	Capillary Unit	
29	Flange Assy	
30	Capillary	
31	Condenser Assembly	
32	Check Valve	
33	Oil Separator	
34	L-Tank	Assembly
35	Compressor	E656DHD-65D2
36	MG SW	
37	Resistor	
38	Resistor	
39	Resister	

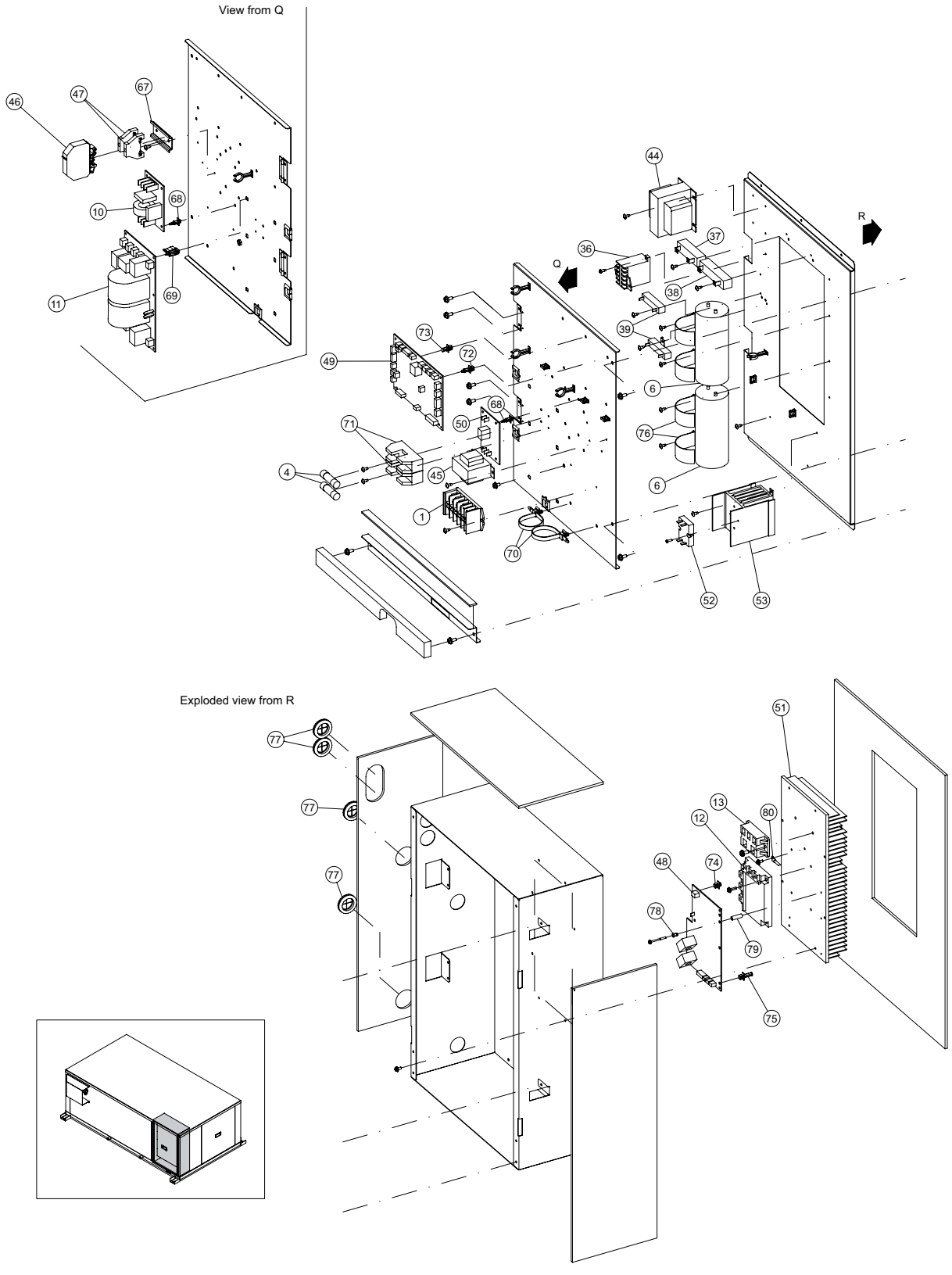
8.2.2. Refrigerant Cycle



Drawing Nº: EPN200809

No.	Description	Remarks
40	SVB Assy.	
40-1	Body 20	Solenoid Valve
40-2	Harness SVA2	SVA2 (Solenoid Valve Coil)
41	SVF Assy.	
41-1	Body	Solenoid Valve
41-2	Harness SVF	SVF (Solenoid Valve Coil)
42	4 Way Valve	Reversing Valve
43	Harness RVR	RVR (Reversing Valve Coil)
44	Reactor	DCL
45	Transformer	TF
46	Circuit Breaker	
47	End Clamp	
48	PV041 Assy	For Inverter
49	Printed Circuit Board	Main (PO052 Assy)
50	RPP Relay	
51	Inverter Fin	For Inverter
52	SSR	
53	Heat Sink	
54	Drain Pan Assembly	Assembly
55	B-Base Assy	Assembly
56	Back Cover Assy.	Assembly
57	E-Box Cover Assy.	Assembly
58	Front Cover Assy.	Assembly
59	L-Back Corner Assy.	Assembly
60	L-Corner Assy.	Assembly
61	L-Cover Assy.	Assembly
62	Inlet Air Frame Assy.	Assembly
63	Outlet Air Frame Assy.	Assembly
64	R-Corner Assy.	Assembly
65	R-Cover Assy.	Assembly
66	Upper Cover Assy.	Assembly
67	RAIL	
68	Spacer	
69	Holder	
70	Clamp	
71	Fuse Holder	
72	Spacer	
73	Push Spacer	
74	Push Spacer	
75	Push Spacer	
76	Band	
77	Rubber Bush	
78	Bush	
79	Collar	

8.2.3. Electrical equipment



Drawing Nº: EPN200809

No.	Description	Remarks
80	Thermistor	For Inverter
81	R-Back Cover Assy.	Assembly
82	Special Nut	
83	Condenser Stay 1	
84	Condenser Stay 2	
85	Handle	
86	S-Valve Protection Stay	
87	Foot Assy	Assembly
88	Fan Duct Connection	
89	FS Stay	
90	Float Switch	
91	C-Heater	
92	Pipe SC1 Unit	
93	Pipe SC2 Unit	
94	G Valve Assy	
95	L Valve Assy	
96	4 Way Valve Assy.	
97	Pipe C Assy.	
98	Pipe D Assy.	
99	Pipe S Assy.	
100	Pipe E	
101	L-Pipe 3	
102	Rubber Cap	
103	RC Cover	
104	Cover	

9. Servicing

Contents

9. Servicing 215

9.1. RASC-(3/5)HVRNE 217

9.1.1. Removing piping service cover 217
9.1.2. Removing fan service cover 217
9.1.3. Removing electrical box service cover 217
9.1.4. Removing the outdoor unit fan motor 218
9.1.5. Removing the compressor 220
9.1.6. Removing the high pressure switch (PSH) and pressure switch for control (PSC) 222
9.1.7. Removing reversing valve coil 222
9.1.8. Removing expansion valve coil 223
9.1.9. Removing expansion valve 223
9.1.10. Removing reversing valve 224
9.1.11. Removing solenoid valve 225
9.1.12. Removing the PCB 226
9.1.13. Removing electrical components 227

9.2. RASC-10HRNE 228

9.2.1. Removing piping service cover 228
9.2.2. Removing fan service cover 228
9.2.3. Removing electrical box service cover 228
9.2.4. Removing the outdoor unit fan motor 229
9.2.5. Removing the compressor 231
9.2.6. Removing the high pressure switch (PSH) and pressure switch for control (PSC) 233
9.2.7. Removing reversing valve coil 233
9.2.8. Removing expansion valve coil 234
9.2.9. Removing expansion valve 234
9.2.10. Removing reversing valve 235
9.2.11. Removing solenoid valve 235
9.2.12. Removing the PCB 236
9.2.13. Removing electrical components 237

9.3. Collecting refrigerant for replacing indoor unit 238

	DANGER

- *Electrical hazard. Risk of death.*
- *Before performing any of the service operations described in this chapter, turn all the main switches off and place security lockers or convenient warning indicators in order to prevent them from turning on accidentally.*
- *Check and be sure that the LED201 (Red) on the inverter PCB is OFF for all electrical maintenance.*
- *Do NOT touch the electrical components when the LED201 (Red) on the inverter PCB is ON to avoid electrical shock.*

	WARNING

- *Crush hazards. Can cause serious injuries.*
- *In case of sharped edged parts, as covers, use security gloves to avoid getting injured.*
- *In case of blocked or stucked parts, use appropiated tools and eventually lubricants to release them.*
- *When performing brazing work, besides security gloves it is a must to wear convenient eye protection.*

	NOTE

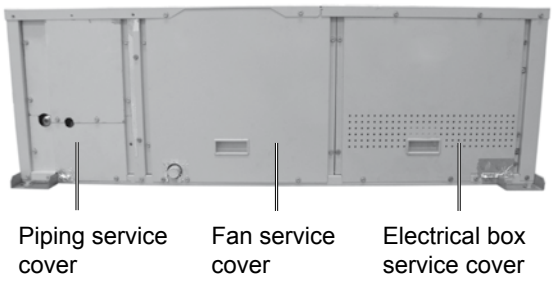
- *All compressors are connected by brazing. Check to ensure whether there are flammable things around or not when using a burner for pipe connections, if not, oil existing pipe inside may ignite.*
- *Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid mixing the water and foreign particles into the refrigerant cycle. After removing compressor, replace it quickly. If exposed for a long period, seal the suction pipe and discharge pipe.*
- *Remove the cap for the compressor just before replacing the compressor. Before mounting the compressor, seal the suction pipe and discharge pipe with a tape to protect the compressor from foreign particles. Remove the tape at pipe connection.*

9.1. RASC-(3/5)HVRNE

9.1.1. Removing piping service cover

Remove the main parts according to the following procedures.

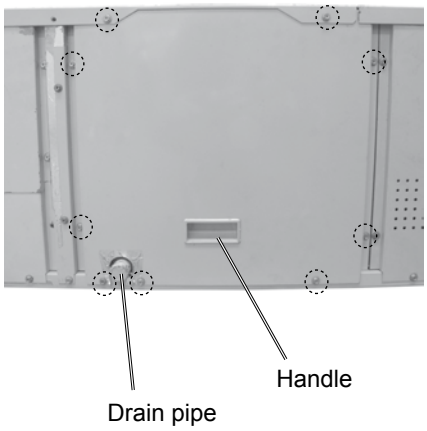
	NOTE
- *To reassemble perform the procedures in reverse.* - *To prevent contamination of the refrigerant with water or foreign particles, do not expose open to atmosphere for long periods.* - *If necessary, seal pipe ends using caps or tape.*	



1. Remove the eleven (11) fixing screws.
2. Slide the service cover downward and remove it.
3. Pay attention while handling the cover and do not fall it off.

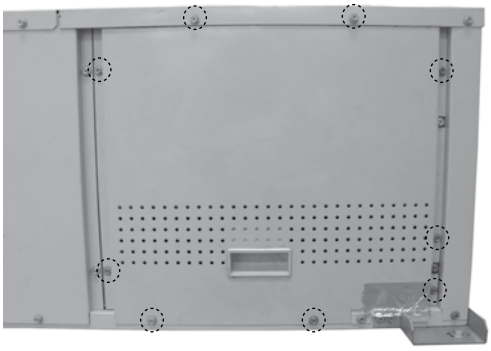
9.1.2. Removing fan service cover

1. Remove the nine (9) fixing screws.
2. Slide the service cover downward and remove it using the handle.
3. Pay attention while handling the cover and do not fall it off.



9.1.3. Removing electrical box service cover

1. Remove the nine (9) fixing screws.
2. Slide the service cover downward and remove it using the handle.
3. Pay attention while handling the cover and do not fall it off.



9.1.4. Removing the outdoor unit fan motor

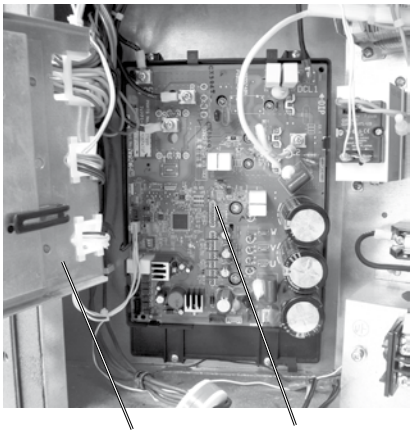
1. Remove the electrical box service cover.

2. Remove the PCB plate by removing it's screw. Turn the PCB plate towards the front side.

3. Disconect all the wires to the DIP-IPM, according to the dotted marks in the photo.

	DANGER

- *Electrical hazard. Risk of death.*
- *Check that the LED201 (red) located on the DIP-IPM is OFF.*
- *Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.*
- *Do not touch the electrical components of the PCB directly.*



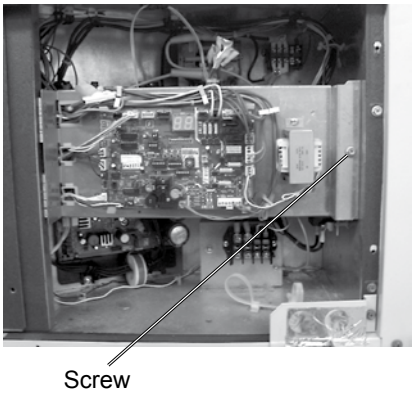
4. Remove the four (4) screws fixing the DIP-IPM. Draw the DIP-IPM towards the front side and leave it in a clear and safe place to prevent any damage.

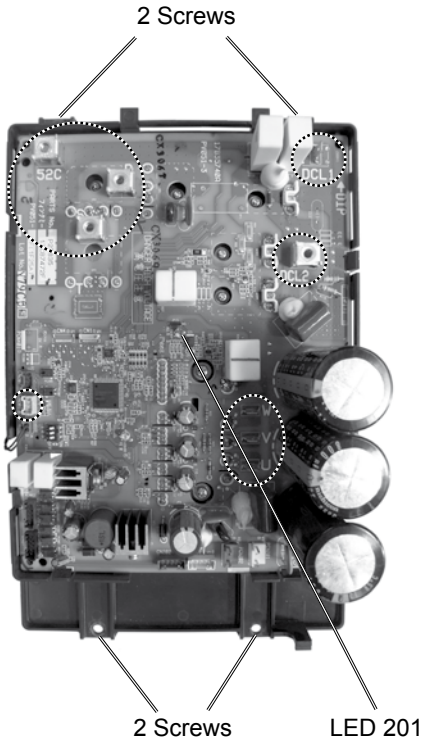
5. Through the hole left by the DIP-IPM, remove the three (3) M5 screws, located inside the unit, in the middle of the fan stay.

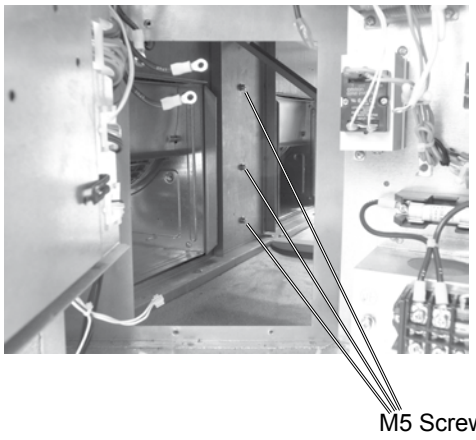
	NOTE

- *Pay special attention to the edges of the plates when removing these screws. Always wear gloves when performing mechanical works.*

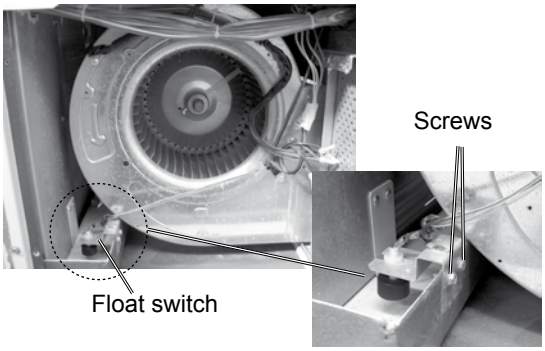
6. Remove float switch assembly from the drain pan by removing the two (2) screws.



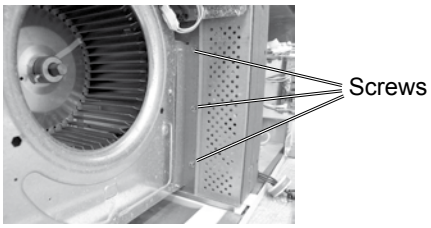




7. Remove the three (3) screws fixing the fan stay and slowly, begin to draw it towards by paying attention to the wiring and the drain pan.
   When half of the fan unit is out, disconnect the connector for the fan motor and pull out the fan motor unit completely.



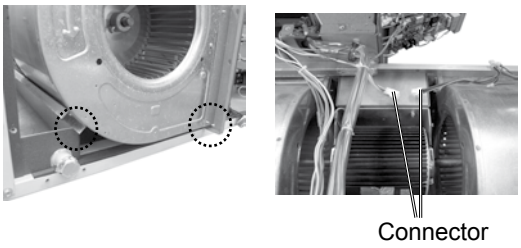
	CAUTION
- *Lifting hazard. Single person operation could cause injury. Fan unit weight is approx. 30Kg. Use two-man lift..*	



8. Once with the fan unit on the floor, remove the four (4) screws at the back side of the casing and remove the stay.

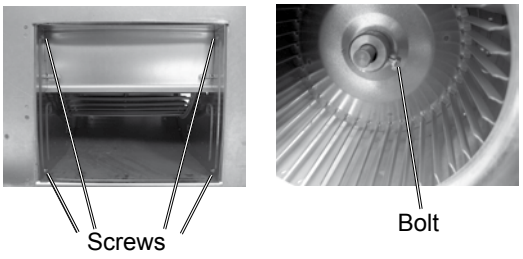
9. Turn the casing so the screws fixing each fan motor are visible, and remove the screws (4 per fan). Also remove the bolt fixing each motor shaft.

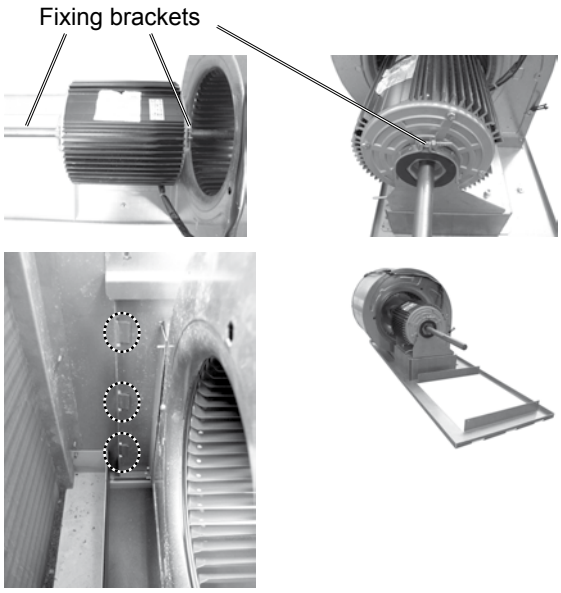
10. Remove the fan motor by removing the fixing bolts and fixing brackets.



11. Reassemble the parts in the reverse order of removing order.

	NOTE
- *Pay special attention when placing the whole set again inside the unit, as there are some flat steel pieces to hold the whole spare part at the end of the rail. Push the set to wall, and, at the same time, push it inside. See photo besides.* - *Always wear gloves when performing mechanical works.*	

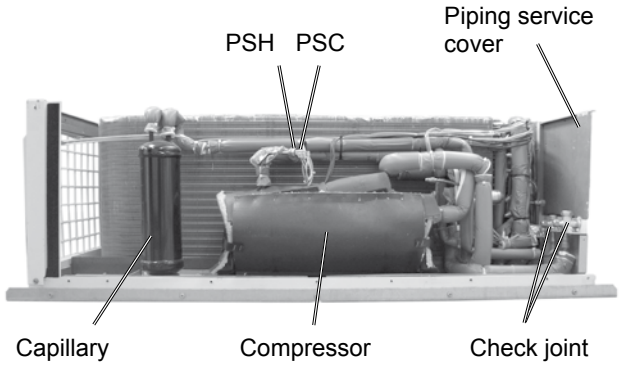




9.1.5. Removing the compressor

	NOTE

- *If the outdoor unit and upper obstacle such as the ceiling is too close (less than 1 meter), it is necessary to disconnect the refrigerant piping after collecting all the refrigerant from the check joint.*
- *If it's possible, move the unit to ensure more service space for servicing the compressor.*
- *Do not deform any piping when you are removing the covers. If you deform the piping, the welded portion may be broken.*

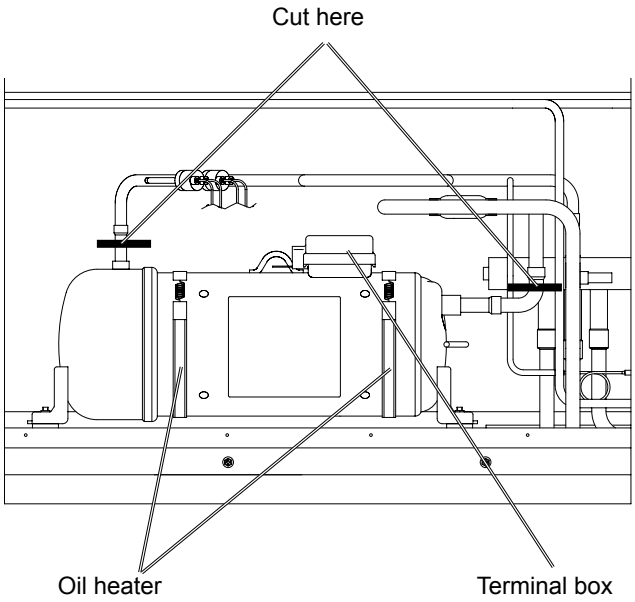


1. Revome half of the upper cover by removing the fifteen (15) fixing screws. Also remove the piping service cover by removing the eleven (11) fixing screws.

2. Open the sound insulation cover wrapped around the compressor and remove the terminal box cover at the compressor fixed by one (1) screw. Disconnect the compressor wires in the terminal box.

	NOTE

- *Make sure that the fasten terminals for the compressor are normal. Any lack of grip should lead to a change of the old terminals for new ones. It is recommended to clamp the fasten terminals to improve the contact.*
- *Check and take Note of each terminal number and indications for its correct connection at the reasembling process. If wires are connected in incorrect order, it will lead to a compressor failure.*



3. Remove the rubber cap and the thermistor on the top of the compressor.

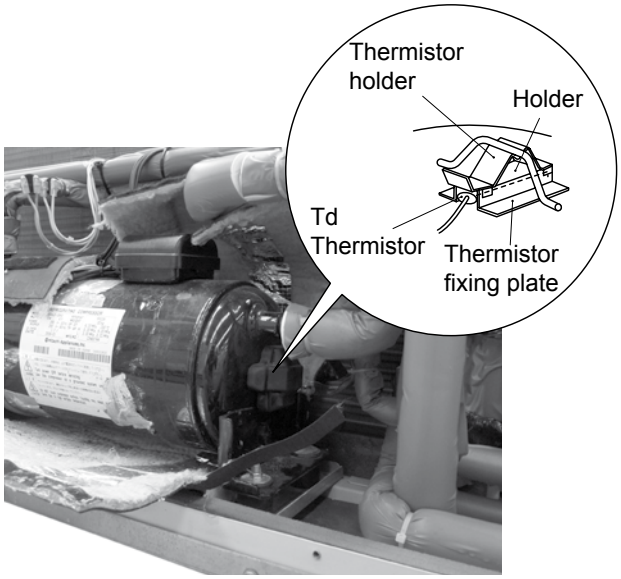
4. Remove the two (2) crankcase heaters by releasing the springs.

	CAUTION

- *Explosion risk. Can cause injuries. Make sure that there is no positive pressure inside the pipes.*

5. Cut the pipe at the compressor side of the brazing part.

6. Remove the cut pipe by using a burner, after cutting.



	NOTE

- *Completely clean the oil in case it has spread to other parts of the unit, such as bottom base, pipes and others.*
- *Make sure that the pipes are cut before working with a burner.*
- *Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid water and foreign particles entering into the refrigerant cycle. After removing the compressor, replace it quickly. If it is exposed to the ambiance for a long period, seal both suction and discharge pipes.*
- *Remove the cap for the compressor just before replacing the compressor. Before assembling the compressor, seal the suction pipe and discharge pipe with tape to protect the compressor interior from foreign particles. Remove the tape when connecting the pipes.*

7. Remove the four (4) nuts fixing the compressor and remove the compressor. When doing this, pay special attention not to touch or deform the sorrounding pipes.

8. Isolate the wires and electrical components to protect them from the burner flame when brazing the connection pipes.

9. For brazing the compressor connection pipes, first cool down the compresor piping side covering it with wet clooth. Then brazing material will not enter into the compressor. If the brazing material enters the compressor, it will cause compressor failures.

10. Reassemble the parts in the reverse order of the indicated removing procedures.
    - Tighten the screws (U, V and W) for compressor wires with 2.5N.m.
    - Fix the lead wire firmly.

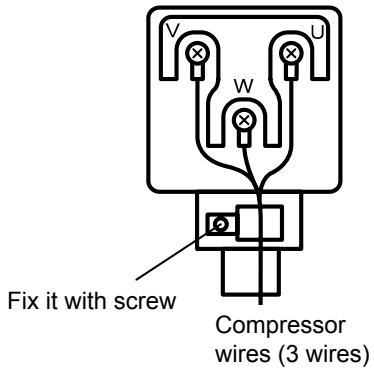
	NOTE

- *Fix the lead wire for the compressor firmly using a cable tie to aviod contacting the metal sheet sharp edges and the high temperature piping.*

	WARNING

- *Risk of fire. Smokes and other damages may occur. All compressor pipes must be brazed to be connected to the refrigerant circuit. Ensure that all the sourrounding is free of flammable objects and liquids when performing piping brazing work.*

Details for compressor terminals



9.1.6. Removing the high pressure switch (PSH) and pressure switch for control (PSC)

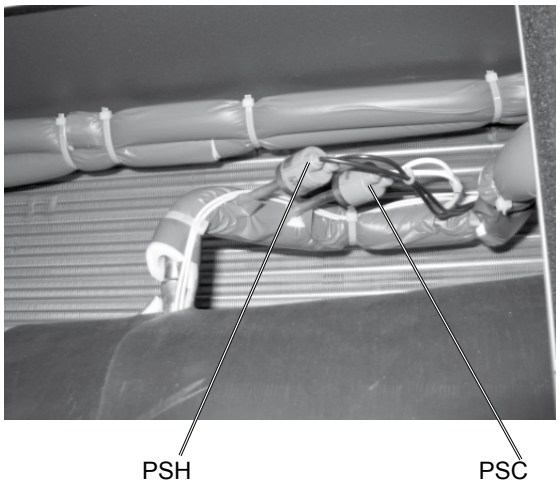
1. Remove the six (6) screws of the side cover. Slide the cover downward.

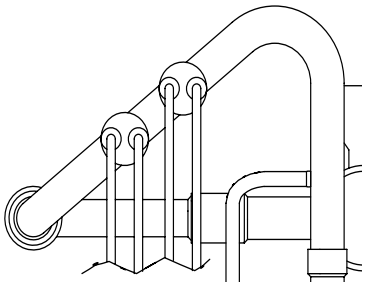
2. Remove the electrical service cover by unscrewing the nine (9) fixing screws. Slide the service cover downward and remove it using the handle.

3. Collect the refrigerant from the check joint.

4. Disconnect the connector in the electrical box:
   - PCN13: PSC
   - PCN8: PSH and disconnect Float Switch connector, RPR Relay board and Magnetic Switch terminals.

5. Cut the high pressure switch and control pressure switch from the brazing neck using a burner.





9.1.7. Removing reversing valve coil

	DANGER

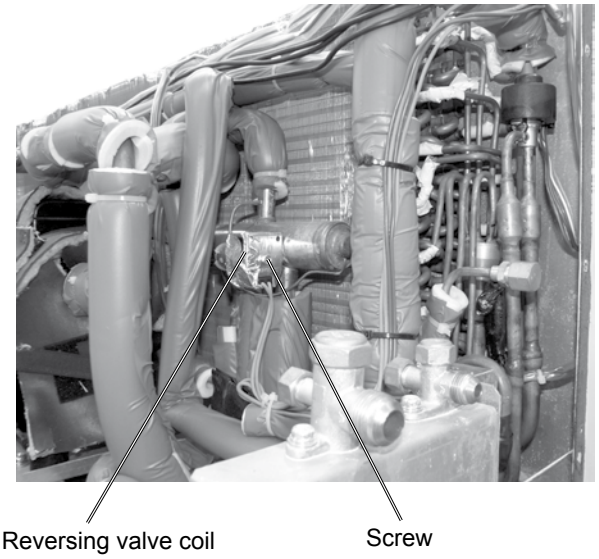
- *Electrical hazard. Risk of death.*
- *Check that the LED201 (red) located on the DIP-IPM is OFF.*
- *Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.*
- *Do not touch the electrical components of the PCB directly.*

1. Remove the six (6) screws of the side cover. Slide the cover downward.

2. Remove the electrical service cover by unscrewing the nine (9) fixing screws. Slide the service cover downward and remove it using the handle.

3. Disconnect the PCN6 connector on the PCB in the electrical box.

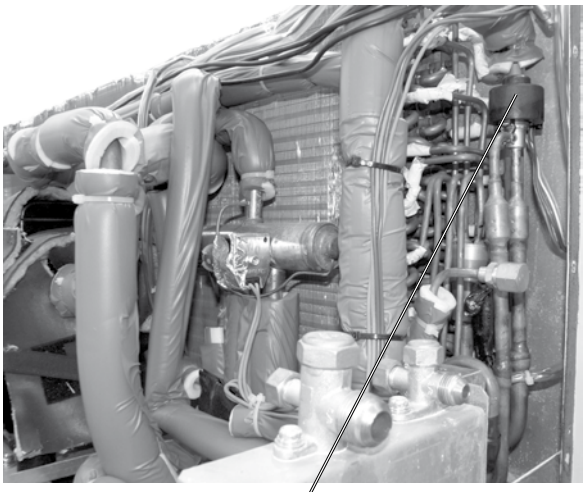
4. Remove the reversing valve coil by removing the screw fixing the coil.



9.1.8. Removing expansion valve coil

	DANGER

- *Electrical hazard. Risk of death.*
- *Check that the LED201 (red) located on the DIP-IPM is OFF.*
- *Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.*
- *Do not touch the electrical components of the PCB directly.*



Electronic expansion valve coil

1. Remove the piping service cover by removing the eleven (11) fixing screws.
2. Remove the electrical box service cover by removing the nine (9) fixing screws.
3. Remove the CN5A connector on the PCB in the electrical box.
4. Hold the expansion valve coil and slightly rotate, then pull it up. Refer to the figure below to replace the electrical valve. The lock mechanism is equipped with the expansion valve coil. Check to ensure that the expansion valve coil is locked.

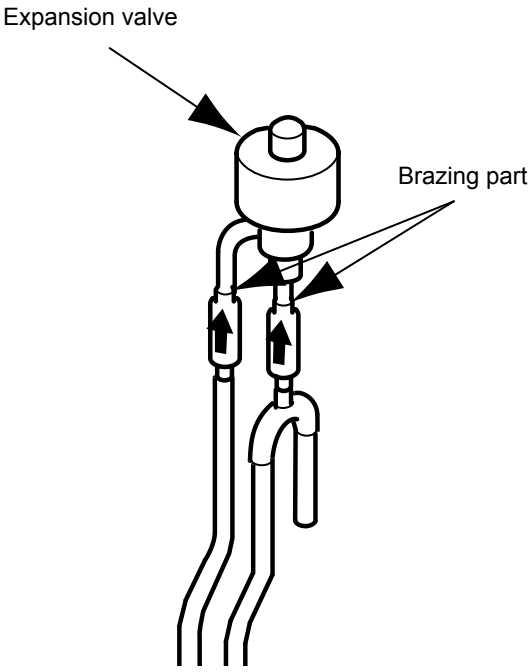
9.1.9. Removing expansion valve

1. Revome the piping service cover by removing the three (3) fixing screws. Pull up and remove the cover using the handle.
2. Collect the refrigerant from the check joint according to the section “Removing Compressor”.
3. Remove the coils according to the section “Removing Expansion Valve Coil”.
4. Remove the brazing as shown in the figure below.

   Electronic Expansion Valve (EV0): 2 brazing parts.

   Perform the brazing to remove and reassemble the electronic expansion valve by cooling with wet cloth.

   Protect the connecting wires and pipe insulation from brazing flame.
5. Reassemble the parts in the reverse order of removing procedures.



9.1.10. Removing reversing valve

1. Remove the six (6) screws of the side cover. Slide the cover downward.

2. Remove the electrical service cover by unscrewing the nine (9) fixing screws. Slide the service cover downward and remove it using the handle.

3. Collect the refrigerant from the check joint according to the section “Removing compressor”.

4. Remove the reversing valve coil according to the section “Removing reversing valve coil”.

5. Remove one (1) fixing screw for the valve-mounting plate.

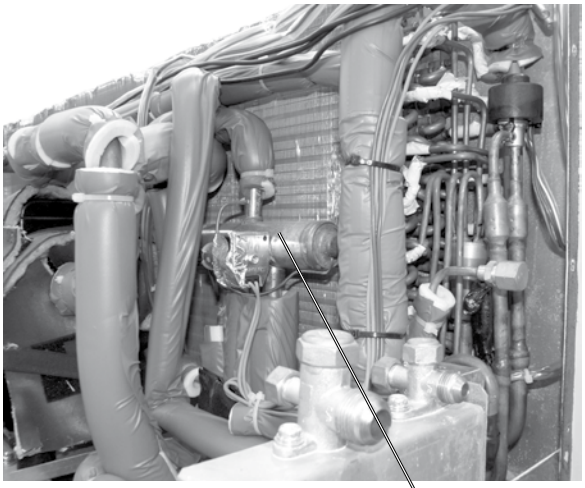
6. Remove the stop valve at the gas side from the valve-mounting plate by removing the two (2) screws.

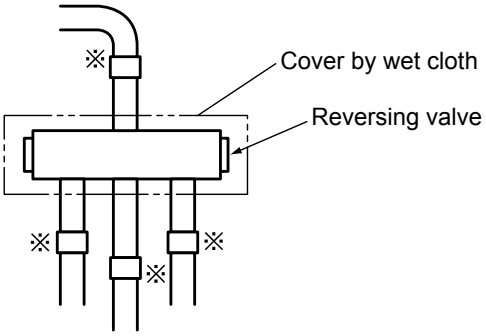
7. Remove the reversing valve assemblies from the 4 brazed parts where it is fixed. Remove the brazing of the reversing valve and the stop valve at the gas using a blowtorch. Cool down the piping side covering it with wet cloth, in order to avoid brazing material entering the reversing valve. Protect the connecting wires and pipe insulation from the brazing frame.

8. Remove the reversing valves from its assemblies 4 brazed parts ※.

   Perform the brazing with a blowtorchto remove and reassemble the reversing valve by cooling the pipes first with wet cloth in order to avoid brazing material entering the reversing valve.

9. Reassemble the parts in the reverse order of removing procedures contained in this chapter. When SFV is removed, fix it according to the section “Removing the Reversing Valve and the Solenoid Valve”contained in this chapter.





9.1.11. Removing solenoid valve

1. Remove the six (6) screws of the side cover. Slide the cover downward.
2. Remove the electrical service cover by unscrewing the nine (9) fixing screws. Slide the service cover downward and remove it using the handle.
3. Collect the refrigerant from the check joint according to the section “Removing compressor” in this chapter.
4. Remove the solenoid valve coil by unscrewing the fixing screw.
5. Remove the brazing and flare nuts. Using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the reversing valve.
6. Perform the brazing to remove and reassemble the solenoid valve.
7. Protect the connecting wires and pipe insulation from the brazing flame.
8. Remove the flare nuts with two spanners to avoid twisting.
9. Reassemble the parts in the reverse order of removing order of removing procedures.

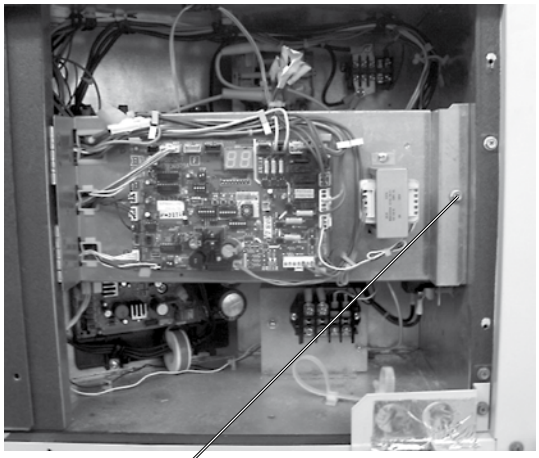
9.1.12. Removing the PCB

	DANGER

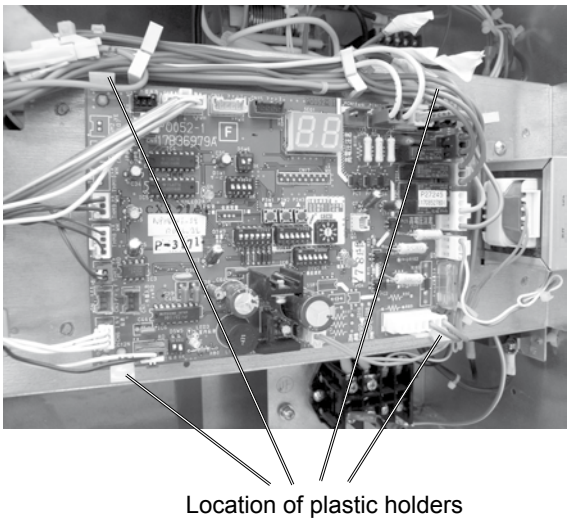
- *Electrical hazard. Risk of death.*
- *Check that the LED201 (red) located on the DIP-IPM is OFF.*
- *Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.*
- *Do not touch the electrical components of the PCB directly.*

	NOTE

- *When handling the PCB, take care of components. Do not apply excesive force to them, in order to avoid damaging the motherboard and failures.*



1. Remove the electrical box service cover by removing the nine (9) fixing screws.
   - Disconnect all the connectors in the PCB.
   - Remove the PCB by unlocking the four (4) plastic holders.
   - Pull out the PCB from the PCB plate.



9.1.13. Removing electrical components

	DANGER

- *Electrical hazard. Risk of death.*
- *Check that the LED201 (red) located on the DIP-IPM is OFF.*
- *Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.*
- *Do not touch the electrical components of the PCB directly.*

	NOTE

- *When handling the PCB, take care of components. Do not apply excesive force to them, in order to avoid damaging the motherboard and failures.*

1. Remove the electrical box service cover by removing the nine (9) fixing screws.

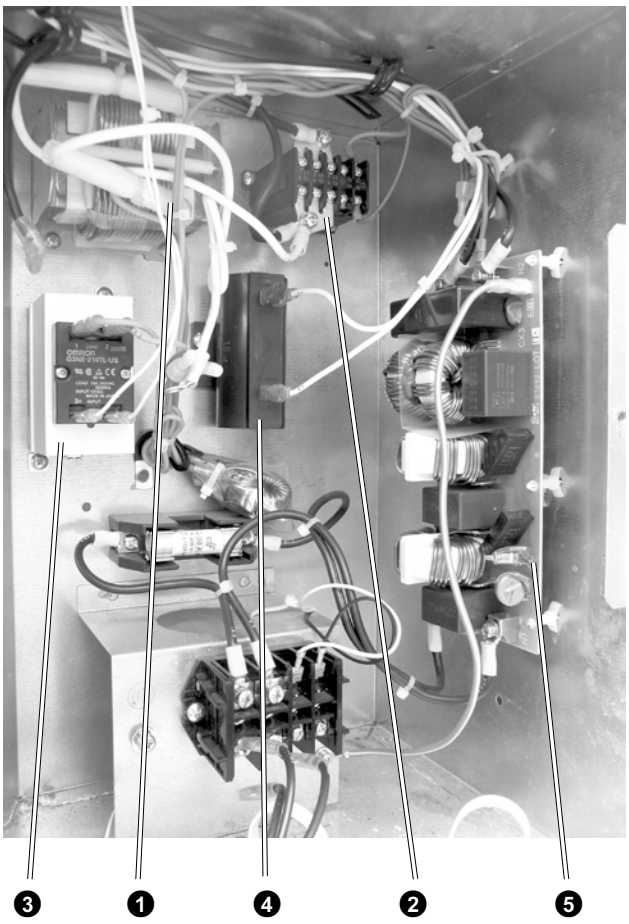
2. Remove the screw fixing the PCB plate and turn it towards the front side.

3. To remove the electrical components:

   – Remove the reactor by removing the four (4) screws.
   – Disconnect the wiring connected to the magnet contactor and remove the magnet contactor by unscrewing the two (2) screws.
   – Disconnect the wiring connected to the SSR and remove the SSR by unscrewing the two (2) screws.
   – Disconnect the fasten connection to the capacitor and remove the capacitor by unscrewing the two (2) screws.
   – Disconnect the wiring connected to the noise filter. Remove the noise filter by holding the expanded part of the holders (6 pieces) with long-nose pliers.

	NOTE

- *Disconnect all the wires connected with the smoothing capacitor (CB, CB1, CB2, CA).*
- *The wire has polar characters. Identify the wire mark band and the indication on the smoothing capacitor when wire connecting.*
- *Identify the terminal numbers with mark band. When reassembling, the terminals have to be connected to the correct numbers . If incorrectly connected, malfunctions or damages will occur.*



Number	Identification
1	Reactor
2	Magnet contactor
3	SSR
4	Capacitor
5	Noise filter

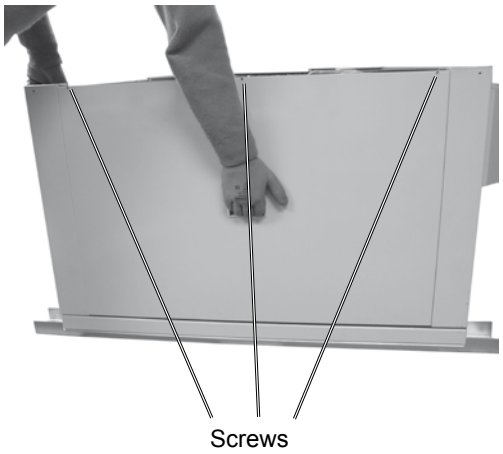
9.2. RASC-10HRNE

9.2.1. Removing piping service cover

Remove the main parts according to the following procedures.

	NOTE
	- *To reassemble perform the procedures in reverse.* - *To prevent contamination of the refrigerant with water or foreign particles, do not expose open to atmosphere for long periods.* - *If necessary, seal pipe ends using caps or tape.*

1. Remove the three (3) fixing screws.
2. Slide the service cover upward. Then, pull up and remove it using the handle.
3. Pay attention while handling the cover and do not fall it off.

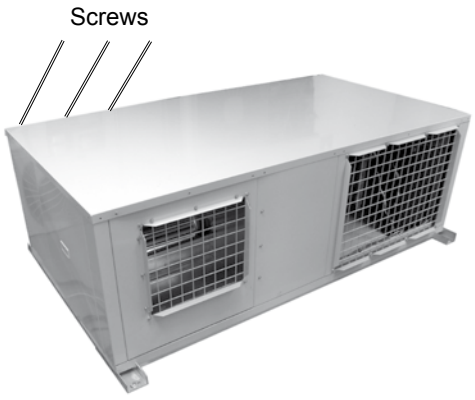


9.2.2. Removing fan service cover

1. Remove the three (3) fixing screws.
2. Slide the service cover upward. Then, pull up and remove it using the handle.
3. Pay attention while handling the cover and do not fall it off.

9.2.3. Removing electrical box service cover

1. Remove the three (3) fixing screws.
2. Slide the service cover upward. Then, pull up and remove it using the handle.
3. Pay attention while handling the cover and do not fall it off.



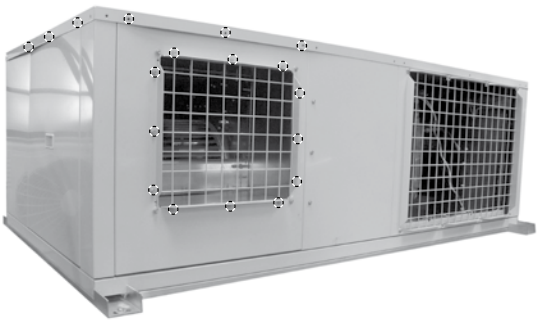
9.2.4. Removing the outdoor unit fan motor

	DANGER

- *Electrical hazard. Risk of death.*
- *Check that the LED201 (red) located on the DIP-IPM is OFF.*
- *Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.*
- *Do not touch the electrical components of the PCB directly.*

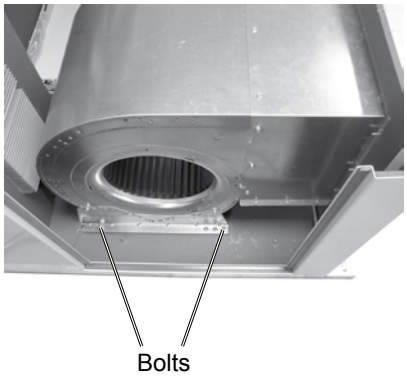
	NOTE

- *Pay special attention to the edges of the plates when removing the screws. Always wear gloves when performing mechanical works.*



1. Remove the fan outlet air frame by removing the twelve (12) screws and the three (3) screws fixing the upper cover. Remove the outlet air frame cover.

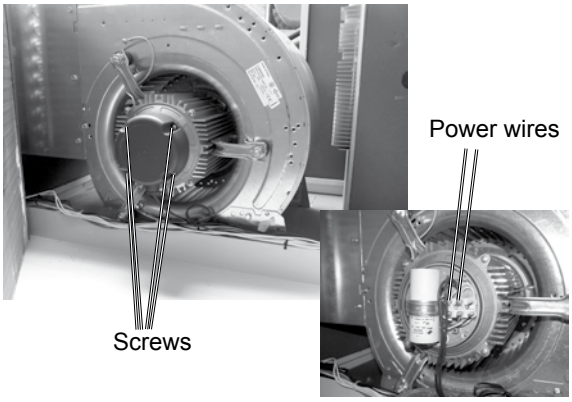
2. Remove the fan service cover by removing the three (3) fixing screws.



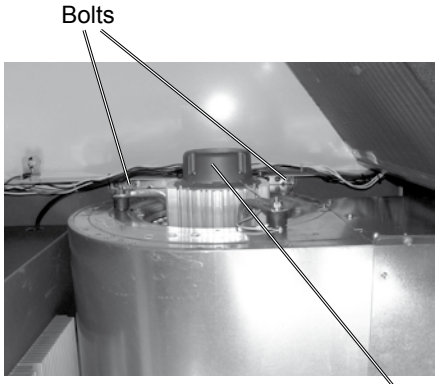
3. Remove the two (2) screws at one side of the fan unit feet from the side of the fan service cover.

4. Remove the side cover by removing the eight (8) screws.

5. Open the fan motor electrical wiring cover by removing the four (4) screws using a screwdriver.



6. Unscrew the power wires and clearly identify them.

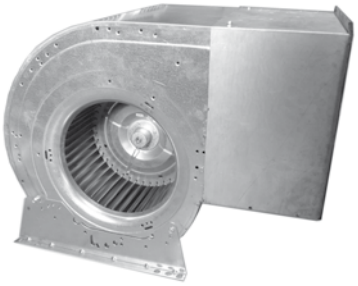


7. Remove the other two (2) screws at the other side of the fan unit feet. Now the fan motor unit is free.

8. Proceed to release the fan unit from the bottom base of the Outdoor unit. Then, begin to turn and pull out the fan unit as shown in the photos.

	CAUTION
	- *Lifting hazard. Single person operation could cause injury. Fan unit weight is approx. 30Kg. Use two-man lift..* - *Always wear gloves when performing mechanical works.*

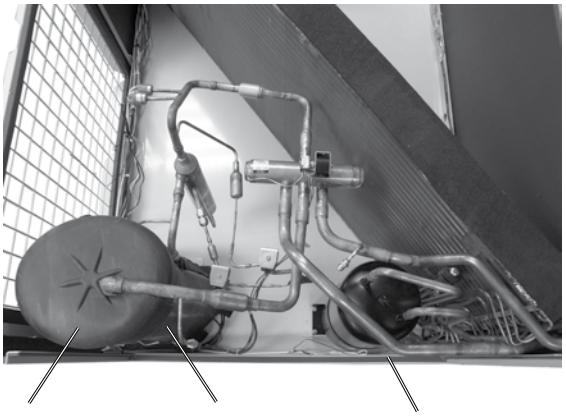
9. Reassemble the parts in the reverse order of removing order.



9.2.5. Removing the compressor

	NOTE

- *If the outdoor unit and upper obstacle such as the ceiling is too close (less than 1 meter), it is necessary to disconnect the refrigerant piping after collecting all the refrigerant from the check joint.*
- *If it's possible, move the unit to ensure more service space for servicing the compressor.*
- *Do not deform any piping when you are removing the covers. If you deform the piping, the welded portion may be broken.*

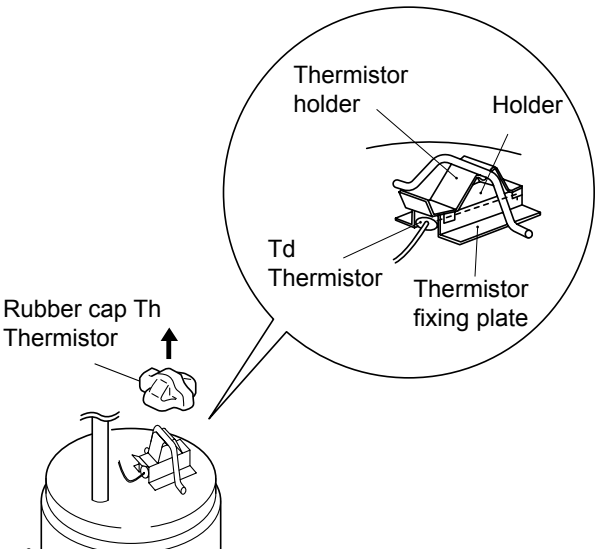


1. Revome the piping service cover by removing the three (3) fixing screws. Pull up and remove the cover using the handle.

2. Open the sound insulation cover wrapped around the compressor and remove the terminal box cover at the compressor fixed by one (1) screw. Disconnect the compressor wires in the terminal box.

	NOTE

- *Make sure that the fasten terminals for the compressor are normal. Any lack of grip should lead to a change of the old terminals for new ones. It is recommended to clamp the fasten terminals to improve the contact.*
- *Check and take Note of each terminal number and indications for its correct connection at the reasembling process. If wires are connected in incorrect order, it will lead to a compressor failure.*



3. Remove the rubber cap and the thermistor on the top of the compressor.

4. Remove the two (2) crankcase heaters by releasing the springs.

	CAUTION

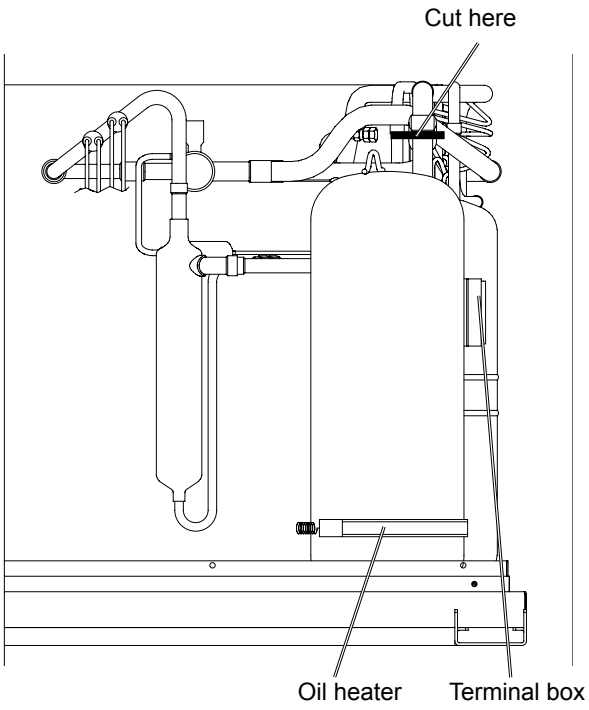
- *Explosion risk. Can cause injuries. Make sure that there is no positive pressure inside the pipes.*

5. Cut the pipe at the compressor side of the brazing part.

6. Remove the cut pipe by using a burner, after cutting.

	NOTE

- *Completely clean the oil in case it has spread to other parts of the unit, such as bottom base, pipes and others.*
- *Make sure that the pipes are cut before working with a burner.*
- *Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid water and foreign particles entering into the refrigerant cycle. After removing the compressor, replace it quickly. If it is exposed to the ambiance for a long period, seal both suction and discharge pipes.*
- *Remove the cap for the compressor just before replacing the compressor. Before assembling the compressor, seal the suction pipe and discharge pipe with tape to protect the compressor interior from foreign particles. Remove the tape when connecting the pipes.*



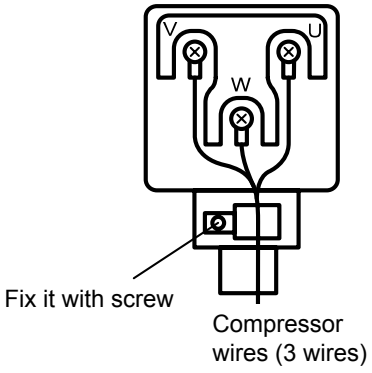
7. Remove the four (4) nuts fixing the compressor and remove the compressor. When doing this, pay special attention not to touch or deform the sorrounding pipes.

8. Isolate the wires and electrical components to protect them from the burner flame when brazing the connection pipes.

9. For brazing the compressor connection pipes, first cool down the compresor piping side covering it with wet clooth. Then brazing material will not enter into the compressor. If the brazing material enters the compressor, it will cause compressor failures.

10. Reassemble the parts in the reverse order of the indicated removing procedures.
    - Tighten the screws (U, V and W) for compressor wires with 2.5N.m.
    - Fix the lead wire firmly

Details for compressor terminals



	NOTE

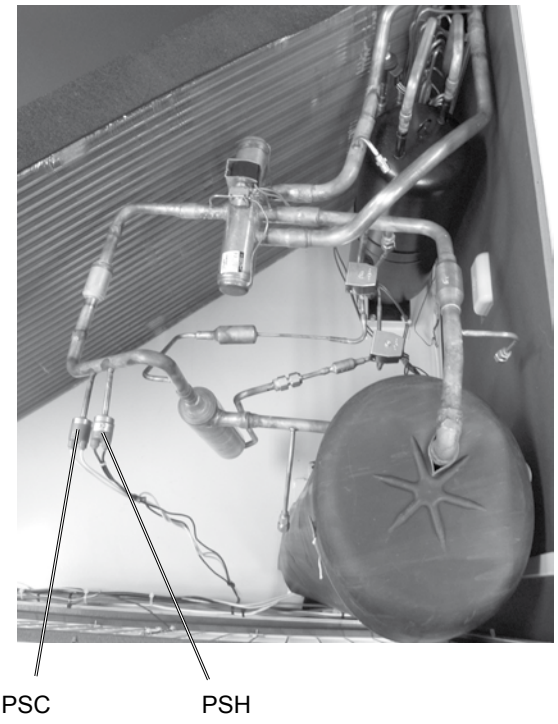
- *Fix the lead wire for the compressor firmly using a cable tie to aviod contacting the metal sheet sharp edges and the high temperature piping.*

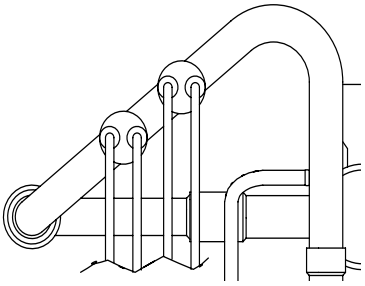
	WARNING

- *Risk of fire. Smokes and other damages may occur. All compressor pipes must be brazed to be connected to the refrigerant circuit. Ensure that all the sourrounding is free of flammable objects and liquids when performing piping brazing work.*

9.2.6. Removing the high pressure switch (PSH) and pressure switch for control (PSC)

1. Remove the eight (8) fixing screws of the inlet protector net.
2. Remove the electrical service cover by unscrewing the three (3) fixing screws. Pull up and remove the cover using the handle.
3. Collect the refrigerant from the check joint.
4. Disconnect the connector in the electrical box:
   - PCN13: PSC
   - PCN8: PSH and disconnect Float Switch connector, RPR Relay board and Magnetic Switch terminals.
5. Disconnect the terminals from the pressure switches.
6. Cut the high pressure switch and control pressure switch from the brazing neck using a burner.

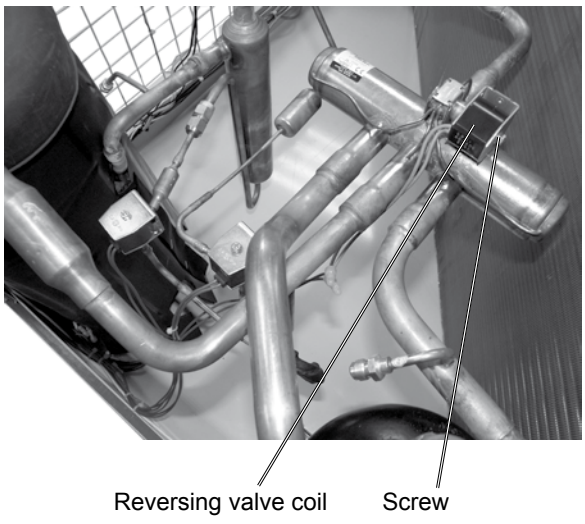




9.2.7. Removing reversing valve coil

	DANGER
	- *Electrical hazard. Risk of death.* - *Check that the LED201 (red) located on the DIP-IPM is OFF.* - *Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.* - *Do not touch the electrical components of the PCB directly.*

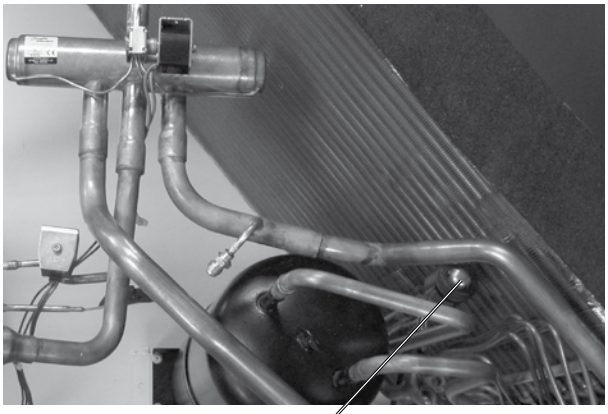
1. Revome the piping service cover by removing the three (3) fixing screws. Pull up and remove the cover using the handle.
2. Disconnect the PCN6 connector on the PCB in the electrical box.
3. Remove the reversing valve coil by removing the screw fixing the coil.



9.2.8. Removing expansion valve coil

	DANGER

- *Electrical hazard. Risk of death.*
- *Check that the LED201 (red) located on the DIP-IPM is OFF.*
- *Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.*
- *Do not touch the electrical components of the PCB directly.*

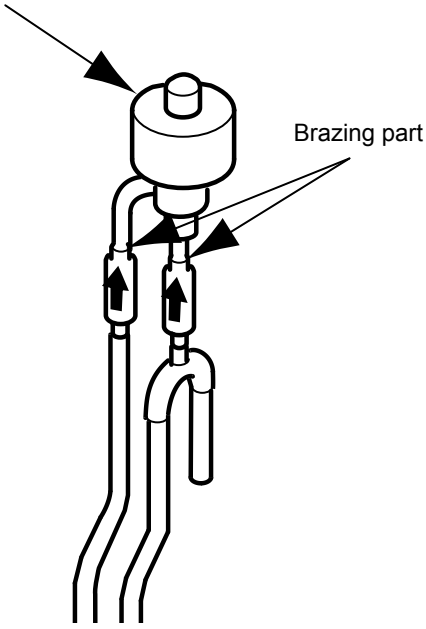


Electronic expansion valve coil

1. Revome the piping service cover by removing the three (3) fixing screws. Pull up and remove the cover using the handle.
2. Remove the CN5A connector on the PCB in the electrical box.
3. Hold the expansion valve coil and slightly rotate, then pull it up. Refer to the figure below to replace the electrical valve. The lock mechanism is equipped with the expansion valve coil. Check to ensure that the expansion valve coil is locked.

9.2.9. Removing expansion valve

Expansion valve



1. Revome the piping service cover by removing the three (3) fixing screws. Pull up and remove the cover using the handle.
2. Collect the refrigerant from the check joint according to the section “Removing Compressor”.
3. Remove the coils according to the section “Removing Expansion Valve Coil”.
4. Remove the brazing as shown in the figure below.

   Electronic Expansion Valve (EV0): 2 brazing parts.

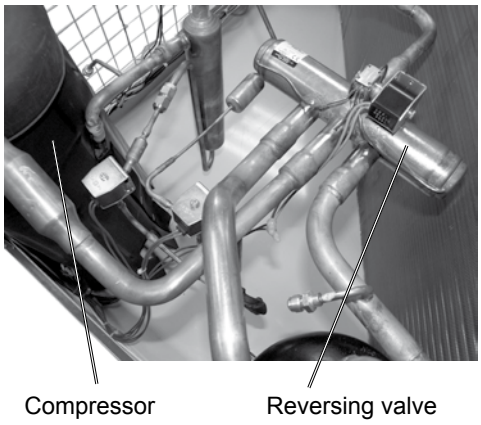
   Perform the brazing to remove and reassemble the electronic expansion valve by cooling with wet cloth.

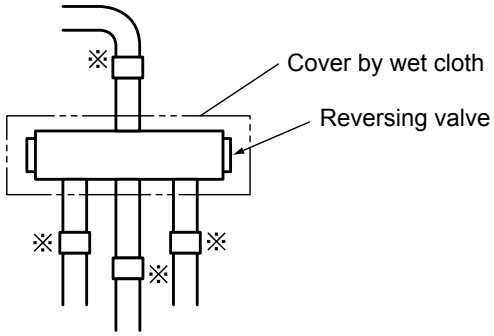
   Protect the connecting wires and pipe insulation from brazing flame.
5. Reassemble the parts in the reverse order of removing procedures.

9.2.10. Removing reversing valve

1. Revome the piping service cover by removing the three (3) fixing screws. Pull up and remove the cover using the handle.
2. Collect the refrigerant from the check joint according to the section “Removing compressor”.
3. Remove the reversing valve coil according to the section “Removing reversing valve coil”.
4. Remove one (1) fixing screw for the valve-mounting plate.
5. Remove the stop valve at the gas side from the valve-mounting plate by removing the two (2) screws.
6. Remove the reversing valve assemblies from the 4 brazed parts where it is fixed. Remove the brazing of the reversing valve and the stop valve at the gas using a blowtorch. Cool down the piping side covering it with wet cloth, in order to avoid brazing material entering the reversing valve. Protect the connecting wires and pipe insulation from the brazing frame.
7. Remove the reversing valves from its assemblies 4 brazed parts ※.

   Perform the brazing with a blowtorchto remove and reassemble the reversing valve by cooling the pipes first with wet cloth in order to avoid brazing material entering the reversing valve.
8. Reassemble the parts in the reverse order of removing procedures contained in this chapter. When SFV is removed, fix it according to the section “Removing the Reversing Valve and the Solenoid Valve”contained in this chapter.





9.2.11. Removing solenoid valve

1. Revome the piping service cover by removing the three (3) fixing screws. Pull up and remove the cover using the handle.
2. Collect the refrigerant from the check joint according to the section “Removing compressor” in this chapter.
3. Remove the solenoid valve coil according to the section “Removing coils for reversing valve and solenoid valve” in this chapter.
4. Remove the brazing and flare nuts. Using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the reversing valve.
5. Perform the brazing to remove and reassemble the solenoid valve.
6. Protect the connecting wires and pipe insulation from the brazing flame.
7. Remove the flare nuts with two spanners to avoid twisting.
8. Reassemble the parts in the reverse order of removing order of removing procedures.

9.2.12. Removing the PCB

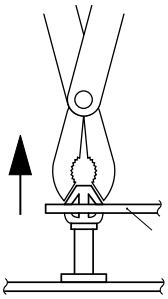
	DANGER

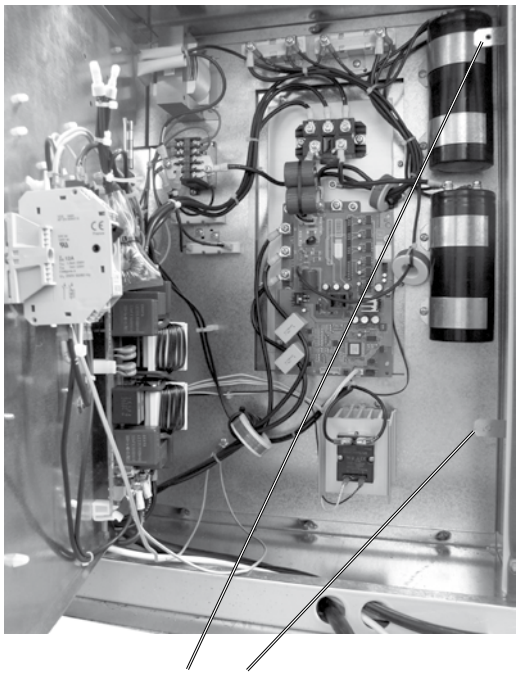
- *Electrical hazard. Risk of death.*
- *Check that the LED201 (red) located on the DIP-IPM is OFF.*
- *Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.*
- *Do not touch the electrical components of the PCB directly.*

	NOTE

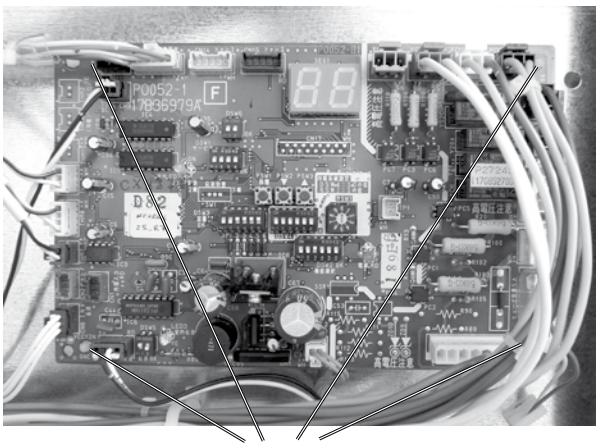
- *When handling the PCB, take care of components. Do not apply excesive force to them, in order to avoid damaging the motherboard and failures.*

1. Revome the electrical box service cover by removing the three (3) fixing screws. Pull up and remove the cover using the handle.
   - Disconnect all the connectors in the PCB.
   - Remove the PCB by pressing the expanded parte of the four (4) plastic holders, using long-nose pliers., as shown in the picture below.
   - Pull out the PCB from the PCB plate.





Screws



Location of plastic holders

9.2.13. Removing electrical components

DANGER

- *Electrical hazard. Risk of death.*
- *Check that the LED201 (red) located on the DIP-IPM is OFF.*
- *Do not touch the electrical components when LED201 (Red) is ON in order to avoid an electrical shock.*
- *Do not touch the electrical components of the PCB directly.*

NOTE

- *When handling the PCB, take care of components. Do not apply excesive force to them, in order to avoid damaging the motherboard and failures.*

1. Revome the piping service cover by removing the three (3) fixing screws. Pull up and remove the cover using the handle.

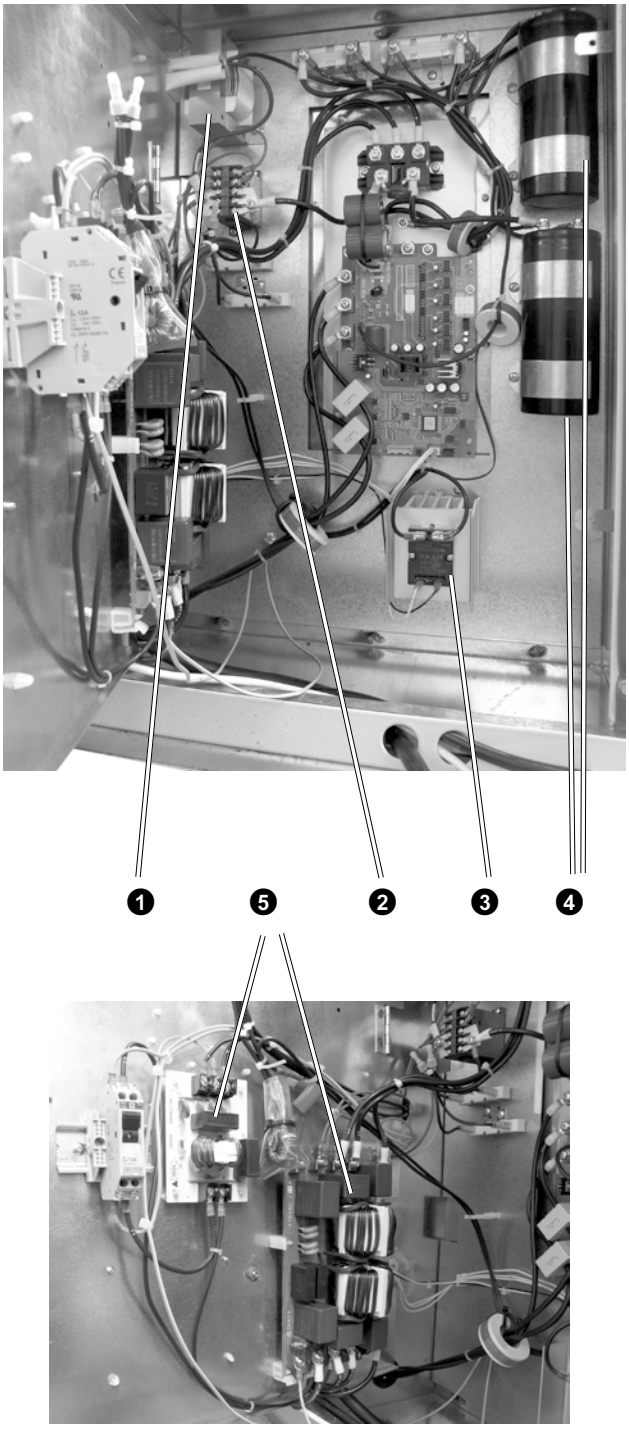
2. Remove the two (2) screws fixing the PCB plate and turn it towards the front side.

3. To remove the electrical components:

   – Remove the reactor by removing the four (4) screws.
   – Disconnect the wiring connected to the magnet contactor and remove the magnet contactor by unscrewing the two (2) screws.
   – Disconnect the wiring connected to the SSR and remove the SSR by unscrewing the two (2) screws.
   – Disconnect the fasten connection to the capacitor and remove the capacitor by unscrewing the two (2) screws.
   – Disconnect the wiring connected to the noise filter. Remove the noise filter by by unlocking the four (4) plastic holders.

NOTE

- *Disconnect all the wires connected with the smoothing capacitor (CB, CB1, CB2, CA).*
- *The wire has polar characters. Identify the wire mark band and the indication on the smoothing capacitor when wire connecting.*
- *Identify the terminal numbers with mark band. When reassembling, the terminals have to be connected to the correct numbers . If incorrectly connected, malfunctions or damages will occur.*



Number	Identification
1	Reactor
2	Magnet contactor
3	SSR
4	Capacitors
5	Noise filter-s

9.3. Collecting refrigerant for replacing indoor unit

When the refrigerant should be collected into the outdoor unit due to indoor/outdoor unit relocation, collect the refrigerant as follows.

1. Attach the manifold gauge to the gas stop valve and the liquid stop valve.

2. Turn ON the power source.

3. Set the DSW1-1 pin of the outdoor unit PCB at the “ON” side for cooling operation. Close the liquid stop valve and collect the refrigerant.

4. When the pressure at lower pressure side (gas stop valve) indicates -0.01MPa (-100mmHg), perform the following procedures immediately.
   – Close the gas stop valve.
   – Set the DSW1-1 pin at the “OFF” side. (To stop the unit operation.)

5. Turn OFF the power source.

	NOTE
- *Measure the low pressure by the pressure gauge and keep it always over -0.01MPa. If the pressure is lower than -0.01MPa, the compressor may be faulty.*	

10. Main Parts

Contents

10. Main parts 239

10.1. Inverter 240

10.1.1. Specifications of inverter 240
10.1.2. Inverter time chart 242
10.1.3. Protective function 243
10.1.4. Overload control 244

10.2. Thermistor 245

10.3. Electronic expansion valve 247

10.3.1. Electronic expansion valve for outdoor unit 247

10.4. High pressure protection device 248

10.5. Noise filters (NF) 249

10.6. Capacitor (CB1, CB2) 252

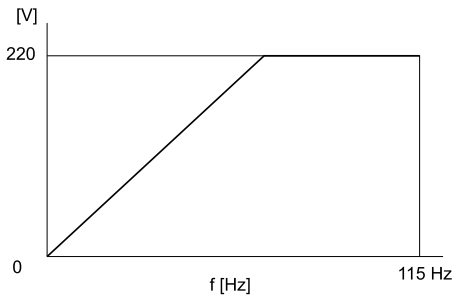
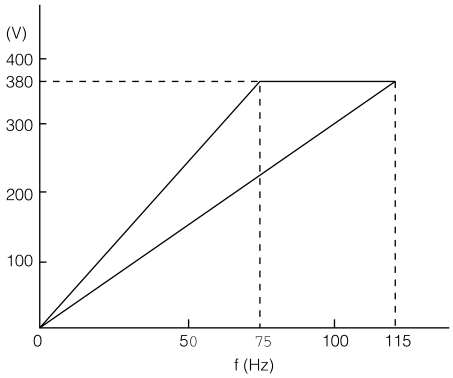
10.7. Reactor (DCL) 252

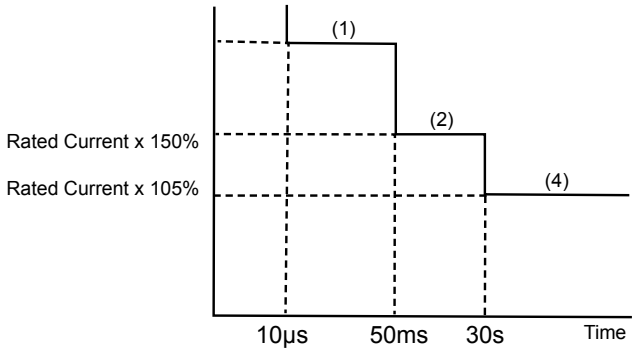
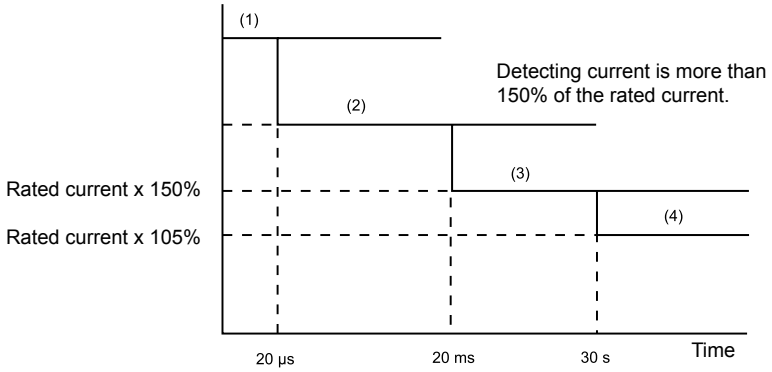
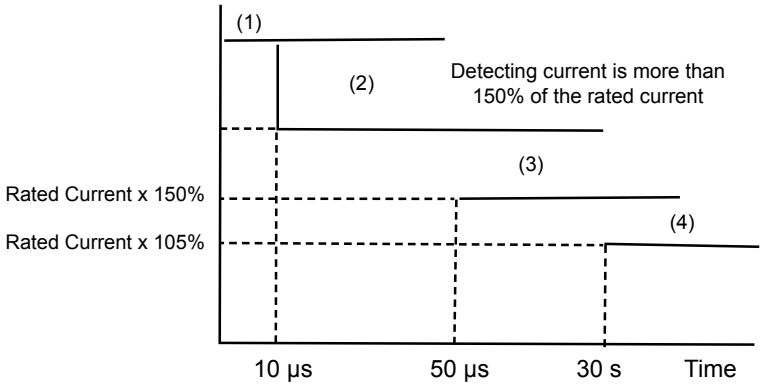
10.8. Scroll compressor 254

10.8.1. Reliable mechanism for low vibrating and low sound 254
10.8.2. Principle of compression 254

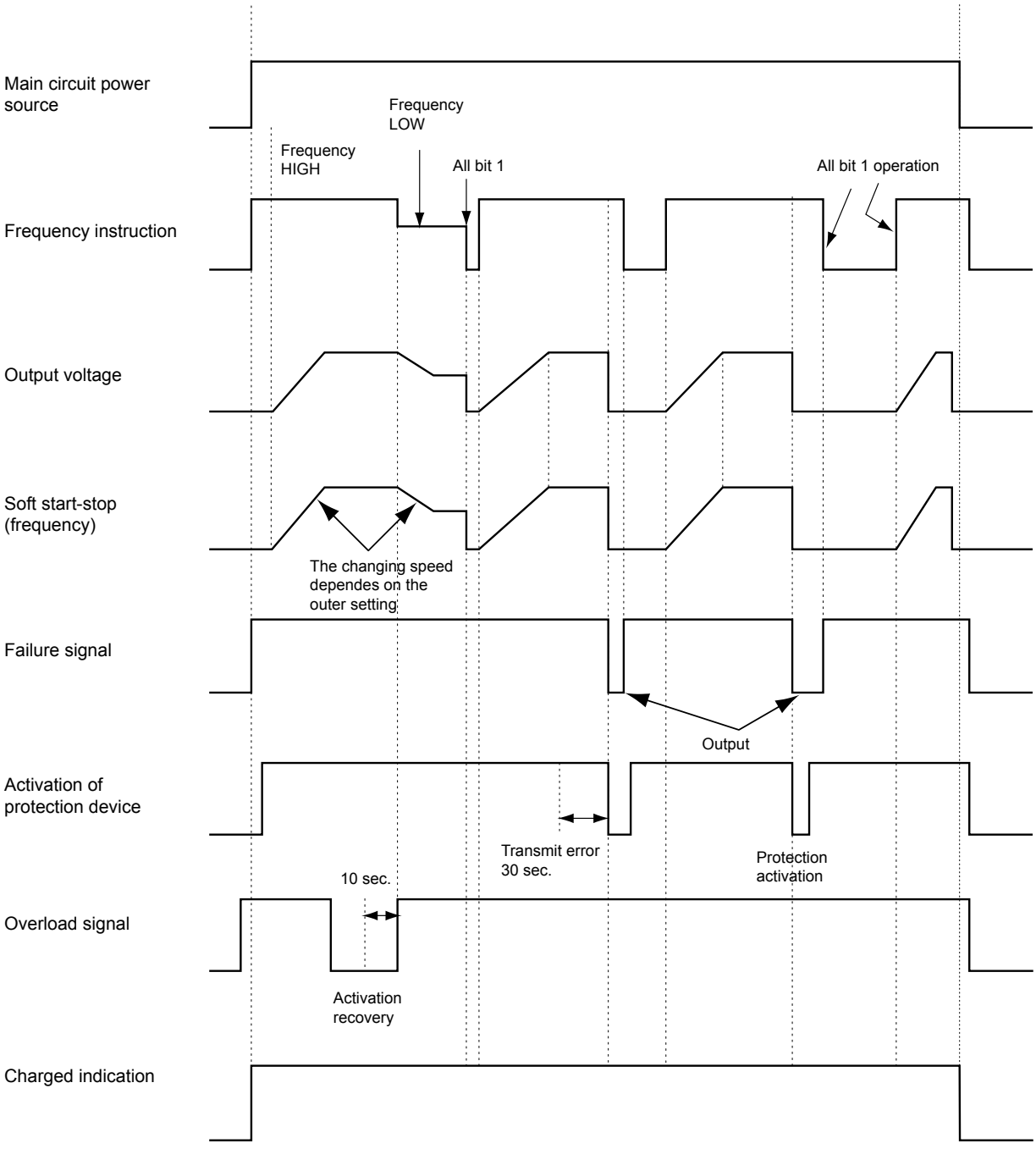
10.1. Inverter

10.1.1. Specifications of inverter

Aplicable model	RASC-(3/5)HVRNE	RASC-10HRNE
Aplicable power source	1~ 230V 50 Hz	3N~ 400V 50 Hz
Input current	17A (RASC-3HVRNE), 25A (RASC-5HVRNE)	25A
Control Method	Vector control	
Range output frequency	20~115 Hz	
Accuracy of frequency	0,01 Hz at applicable frequency range	
Output / characteristics	Conditions 1. Power source voltage AC220/240V 2. Non-loading (free output) 3 Ammeter type volt-meter (X1.1) 	Conditions: 1. Power source voltage AC380/415V 2. Non-loading (free output) 3. Ammeter type volt-meter (X1.1) 
Soft start stop	0.125, 0.5, 1.2 Hz/s (4 steps)	0.125~3.00 Hz/s
Protection function Excessive high or low voltage for inverter	Excessive low voltage at a voltage is lower than 194V DC Excessive high voltage at a voltage is higher than 420V DC	Excessive low voltage at a voltage is lower than 350V DC Excessive high voltage at a voltage is higher than 750V DC
Abnormality of current sensor (0A detection)	Stoppage at a current of compressor smaller than 1.5A. When the frequency is 15 to 18Hz after starting. Cause of abnormality: Failure of current sensor Failure of IPM/DIP-IPM/ ISPM Failure of compressor / fan motor Disconnected wiring	

<table>
<tr><td>Protection function</td><td>RASC-3HVRNE</td></tr>
<tr><td rowspan="5">Overcurrent protection for inverter</td><td> 
</td></tr>
<tr><td>RASC-5HVRNE</td></tr>
<tr><td> 
</td></tr>
<tr><td>RASC-10HRNE</td></tr>
<tr><td> 
</td></tr>
<tr><td>(1) Short-circuit trip of arm *)
(2) Instantaneous overcurrent trip *)
(3) Instantaneous overcurrent trip
(4) Electronic thermal trip
Condition is maintained longer than 30 seconds or accumulated longer than 3 minutes during 10 minutes sampling time.</td></tr>
<tr><td>Protection of IPM</td><td>IPM has four protection function for self-protection..
(1) Some of the output terminals between "U" and "V", "V" and "W", "W" and "U" has a short-circuit.
(2) Running current reaches the maximum rated current.
(3) Abnormal temperature is measured by internal thermistor.
(4) Control voltage decreases abnormally.</td></tr>
<tr><td>Overload control</td><td>Overload control as a current greater than (rated current X105%).
Overload control release at a current smaller than (rated current X 88%).</td></tr>
<tr><td>Fin temperature increase</td><td>The unit is stopped when the fin temperature is higher than 80ºC (1 Phase) 100°C (3 Phase).</td></tr>
<tr><td>Earth detection</td><td>The unit is stopped when the compressor is earthing.</td></tr>
</table>

10.1.2. Inverter time chart



10.1.3. Protective function

1. Excessive high or low voltage for inverter
   a) Level of detection
      - When the voltage of direct current is greater than (A) V, abnormalities are detected.
      - When the voltage of direct current is smaller than (B) V, abnormalities are detected.

Power supply	400V, 50Hz 50Hz	230V, 50Hz
(A)	750	440
(B)	350	194

   b) Function
   When abnormalities are detected, the inverter compressor is stopped and transmit the signal code of stoppage cause to PCB1.
   c) Cancellation of protection function
   Transmission for signal code of stoppage cause is cancelled when a stopping order is given or main power source is cut off.

2. Abnormality of current sensor
   a) Level of detection
   When current of the inverter compressor decreases lower than 0.5A during the inverter compressor frequency between 15Hz and 18Hz, an abnormality is detected.
   b) Function
   When abnormalities are detected, the inverter compressor is stopped, and transmit the signal code of stoppage cause to PCB1.
   c) Cancellation of Protection Function
   Transmission for signal code of stoppage cause is cancelled when a stopping order is issued or main power source is cut off.

3. Overcurrent protection for inverter
   a) Level of detection
   When the current detected by current sensor reaches 150% of the rated current, overcurrent is detected. (Instantaneous overcurrent)
   When the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for 3.5 minutes in total during a 10 minutes period, overcurrent is detected. (Electric thermal relay)
   b) Function
   When abnormalities are detected, the inverter compressor is stopped and transmit the signal code of stoppage cause to PCB1.
   c) Cancellation of protection function
   Transmission for signal code of stoppage cause is canceled by stopping order is issued or main power source is cut off.

4. Protection of IPM/DIP-IPM/ISPM
   a) Level of detection
   When some of the output terminals between “U” and “V”, “V” and “W”, “W” and “U” of IPM/dip IPM/ISPM are short-circuited, an abnormality is detected.
   When the running current of IPM/DIP-IPM/ISPM reaches (maximum rated current x 105%), an abnormality is detected.
   When an internal temperature is measured by internal thermistor of IPM, an abnormality is detected.
   When the control voltage of IPM/DIP-IPM/ISPM decreases, an abnormality is detected.
   b) Function
   When abnormalities are detected, the inverter compressor is stopped and the signal code of stoppage cause is transmitted to PCB1.
   c) Cancellation of protection function
   Transmission for signal code of stoppage cause is canceled when a stopping order is issued or main power source is cut off.

5. Fin temperature increase
   a) Level of detection
      When the temperature of internal thermistor exceeds more than 100 ºC, an abnormality is detected.
   b) Function
      When abnormalities are detected, the inverter compressor is stopped and the signal code of stoppage cause is transmitted to PCB1.
   c) Cancellation of protection function
      Transmission for signal code of stoppage cause is canceled when a stopping order is issued or main power source is cut off.

6. Earth detection
   a) Level of detection
      When the starting current of the compressor reaches 80% of the overcurrent protection value, an abnormality is detected.
   b) Function
      When abnormalities are detected, the inverter compressor is stopped and the signal code of stoppage cause is transmitted to PCB1.
   c) Cancellation of protection function
      Transmission for signal code of stoppage cause is canceled when a stopping order is issued or main power source is cut off.

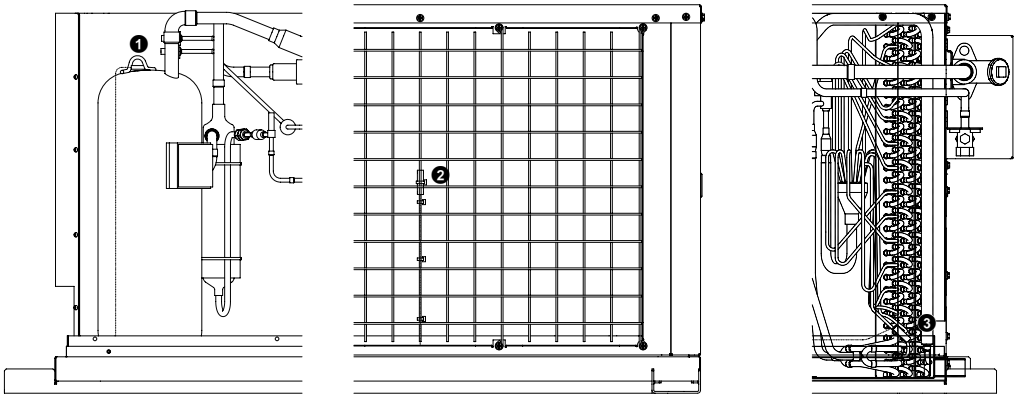
10.1.4. Overload control

a) Level of detection
   When the output current exceeds 105% of the maximum output current, an abnormality is detected.
b) Function
   An overload signal is issued when output current exceeds 105% of the maximum output current, and the frequency decreases.
   For 10 seconds after the output current decreases lower than 88% of the rated current, the operation is performed with the compressor frequency limited to the upper level frequency when the output current decreases lower than 88% of the rated one.
   However, if the frequency order is smaller than the maximum value, the operation is performed according to the order.
c) Cancellation of protection function
   After the operation described in the above item b. is performed for 10 seconds, this control is canceled.

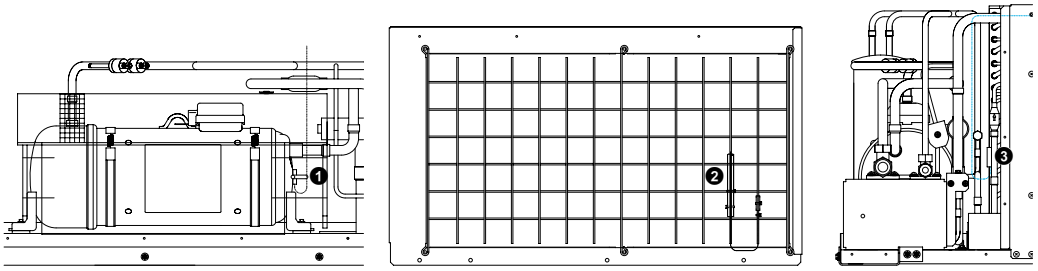
10.2. Thermistor

- Thermistors for the outdoor unit

RASC-10HRNE

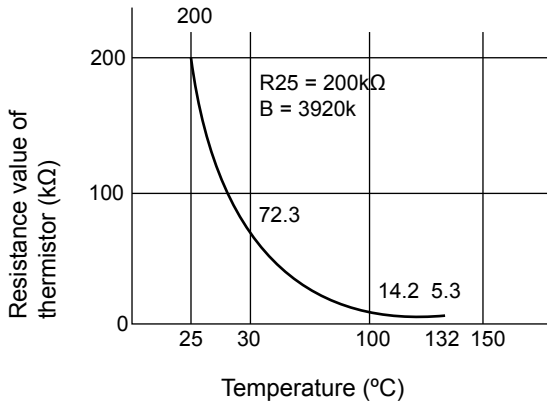


RASC-(3/5)HVRNE



Number	Identification
❶	Thermistor for discharge gas temperature
❷	Thermistor for outdoor ambient temperature
❸	Thermistor for evaporating temperature

- **Thermistor for upper part temperature of compressor**
  (For prevention of discharge gas overheating)
  a) A thermistor for the upper part temperature of the compressor is installed to prevent discharge gas from overheating.
  If discharge gas temperature increases excessively lubricating oil deterioration occurs and lubricating properties deteriorate, resulting in short compressor life.
  b) If discharge gas temperature increases excessively, compressor temperature increases. At the worst, compressor motor winding will be burnt out.
  c) When the upper part temperature of compressor increases during heating operation, the unit is controlled according to the following method
  – An electronic expansion valve of outdoor units is (are) opened to return the liquid refrigerant to the compressor through the accumulator, decreasing compressor temperature.
  – If the compressor upper part temperature increases exceeding 132ºC even if an electronic expansion valve opens, the compressor is stopped, in order to protect the compressor.



Resistance characteristics of thermistor for discharge gas overheating protection

In cooling operation, the above function is also available.

d) If compressor upper part temperature increases excessively, the protection control is activated and the compressor is stopped according to the following method.

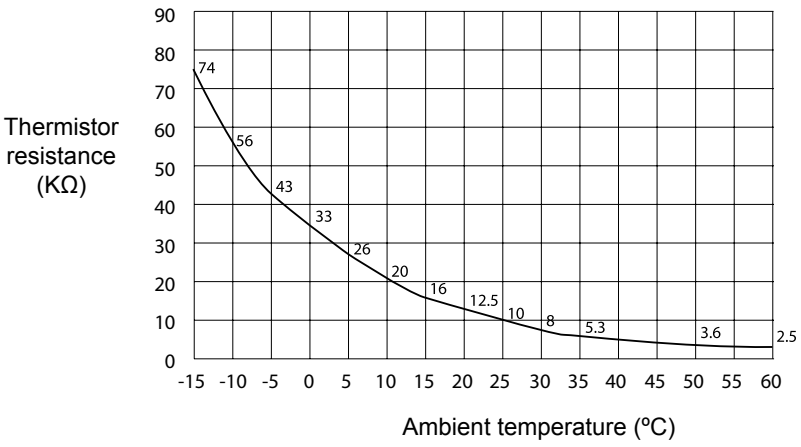
Operation	Upper part temperature of compressor	Defecting period
Cooling	Over 132ºC	10 minutes (continuously)
	Over 140ºC	5 seconds (continuously)
Heating	Over 132ºC	10 minutes (continuously)
	Over 140ºC	5 seconds (continuously)
Defrosting	Over 132ºC	5 seconds (continuously)

- **Thermistor for outdoor ambient temperature**

  The thermistor resistance characteristics are shown in the figure below.

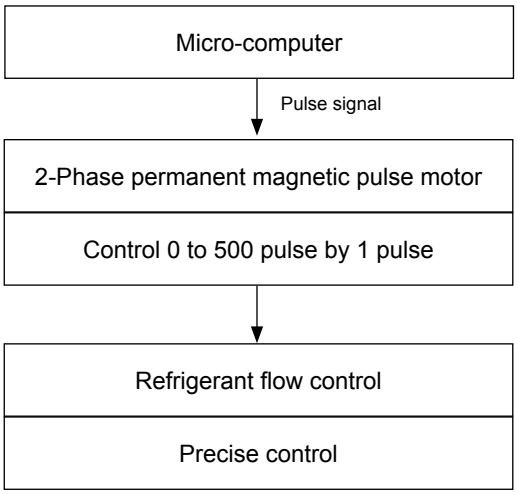
- **Thermistor for evaporating temperature of outdoor unit in heating operation (for defrosting)**
  The characteristics for the thermistor is the same with the value of outdoor ambient temperature thermistor as shown in the figure below.

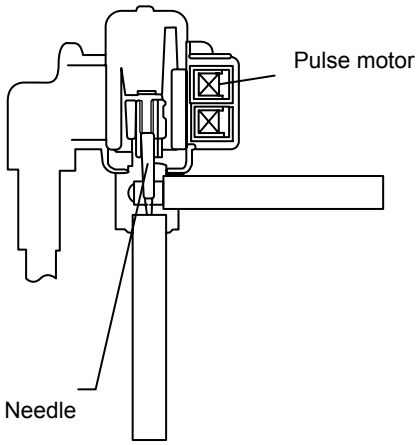
Thermistor characteristics

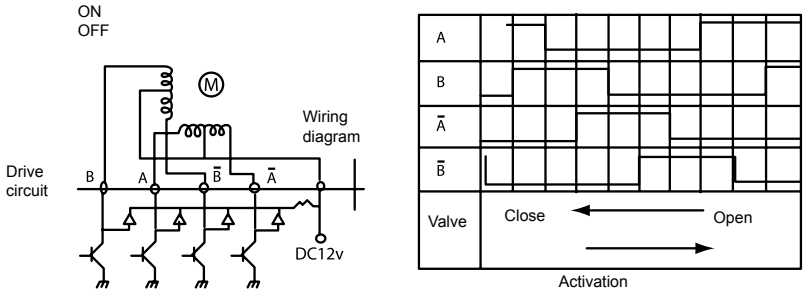


10.3. Electronic expansion valve

10.3.1. Electronic expansion valve for outdoor unit

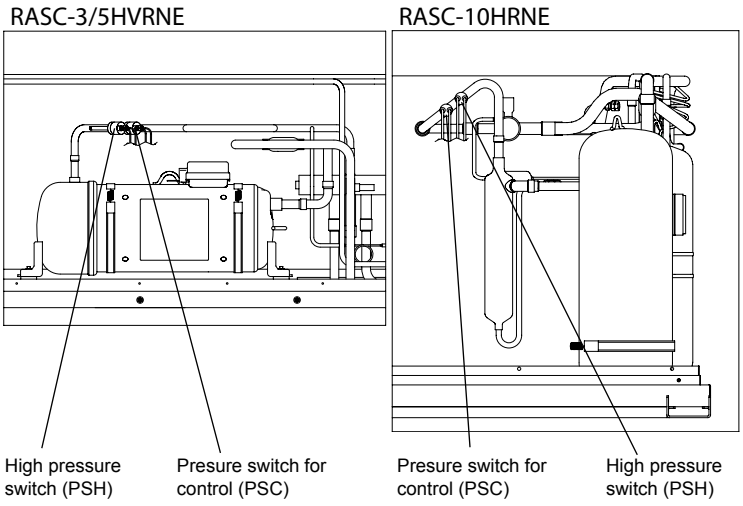




Items	Specifications
Applicable to the models	For the main cycle of: RASC-(3~10)H(V)RNE
Type	UKV(10.0 USRT) series/UKV (5.0USRT) series for MVB
Refrigerant	R410A
Working temperature range	-30°C ~ 65°C (operation time of the coil: less than 50%)
Mounting direction	Drive shaft in vertical direction within an angle of 45° as maximum
Flow direction	Reversible
Drive method	4-Phase canned motor method
Rated voltage	DC12V±1.8V
Drive condition	83PPS (pulse width at ON: 36mm sec, OFF: 60mm sec) 1,2 phase excitation
Coil resistance (each phase)	46Ω ± 10% (at 20°C)
Wiring diagram, drive circuit and activation mode	

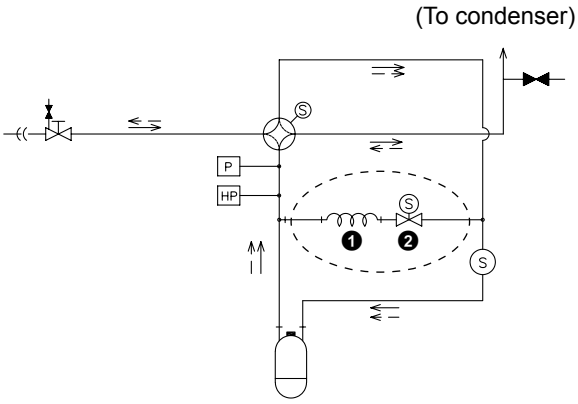
10.4. High pressure protection device

If the discharge pressure is excessively high, the compressor and the component parts of the refrigeration cycle can be damaged. Therefore, in case that the discharge pressure is higher than 4.15MPa (R410A), the protection control is activated and the compressor is stopped.



1. For controlling the high pressure not to increase excessively during heating operation, the gas by-pass circuit and the air volume of the outdoor fan is controlled automatically.

2. The gas by-pass circuit, which is composed of the solenoid valve and the capillary tube for flow adjustment, control the high pressure not to increase excessively by leading the high pressure gas to the low pressure side.



❶ Capillary

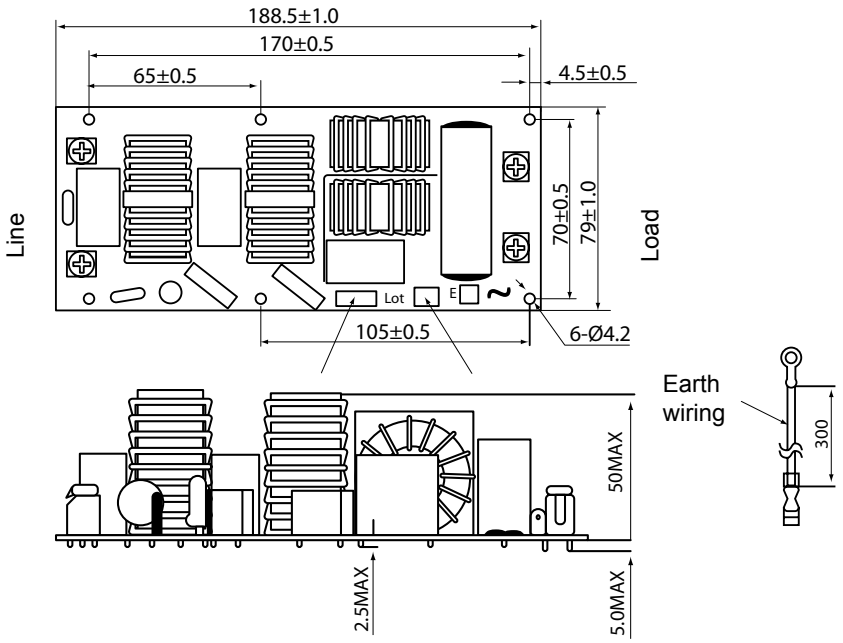
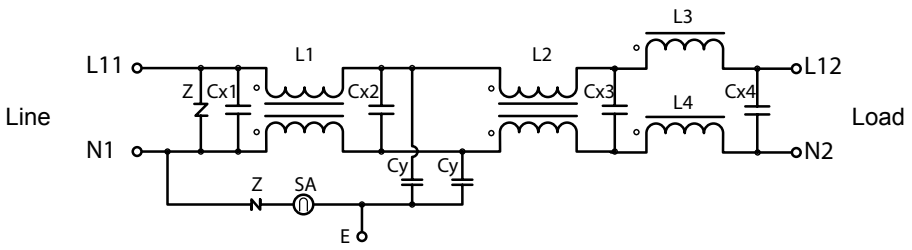
❷ Solenoid valve

(The dotted zone marks the gas by-pass circuit)

10.5. Noise filters (NF)

The noise filter decreases the leakage of noise made by the inverter to the power supply side. Terminals indicated with “LOAD” are connected to the inverter side and terminals indicated with “LINE” to the power supply side.

RASC-(3/5)HVRNE (1~ 230V 50Hz)

Items	Specifications
Model	ALFB-14930-3M
Rated current	AC 230V 30A
Permissible temperature range	-25ºC to 85ºC
General dimensions	
Circuit diagram	

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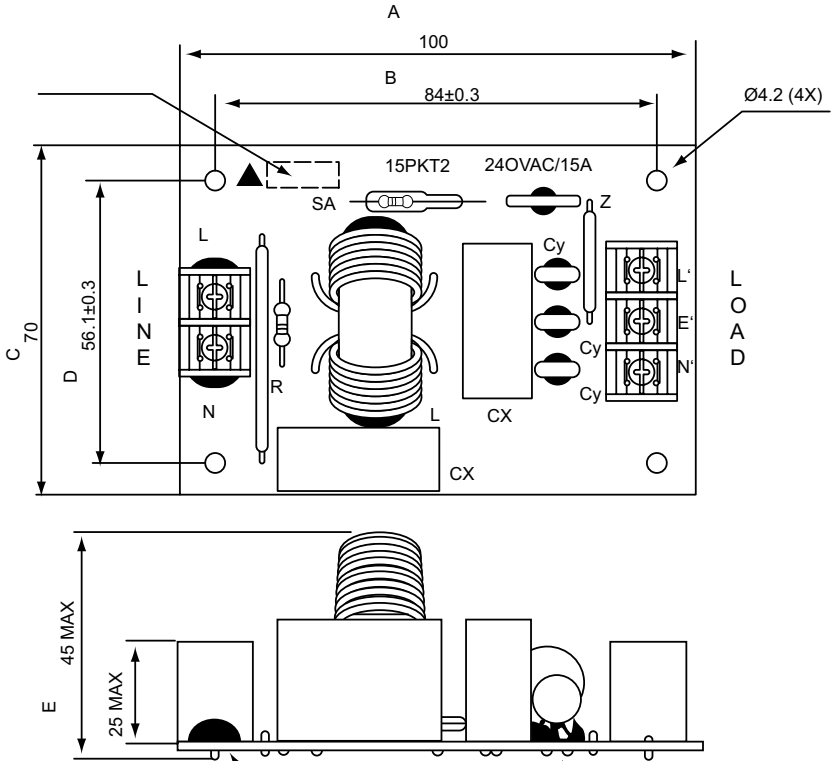
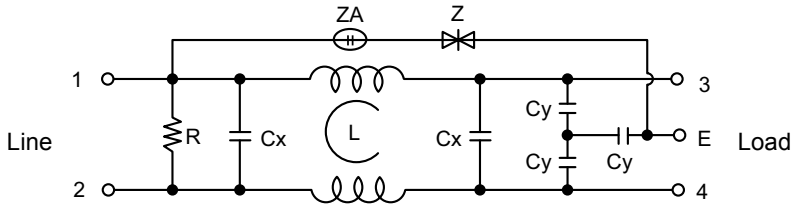
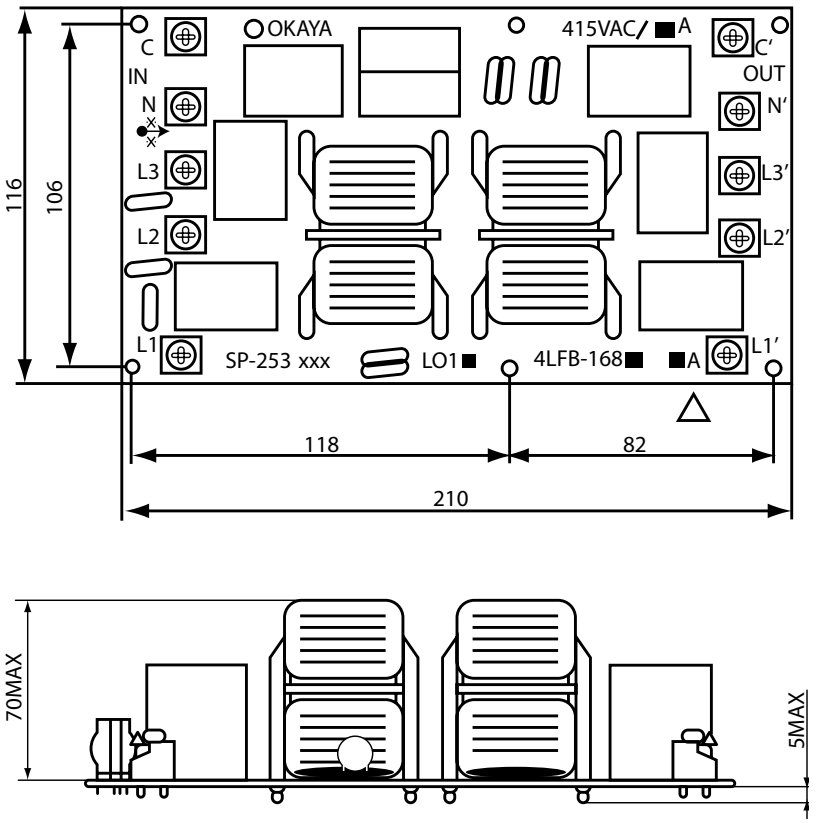
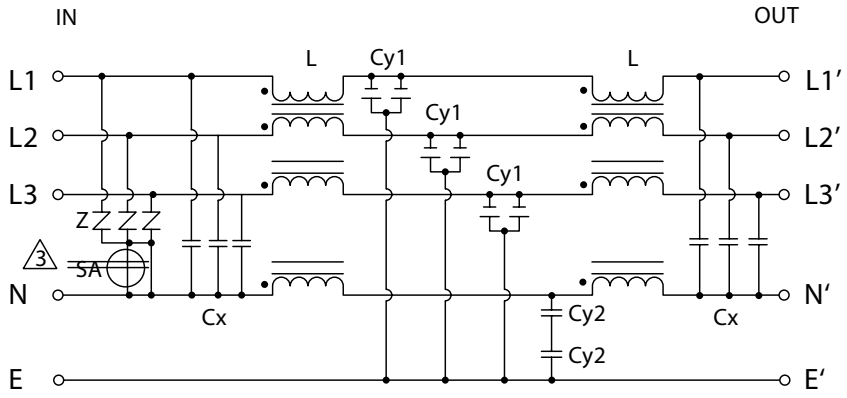
RASC-10HRNE (3N~ 400V 50Hz)

Items	Specifications
Model	15 KPT2
Rated current	AC 250V 15A
Permissible temperature range	-25ºC to 85ºC
General dimensions	
Circuit diagram	

RASC-10HRNE (3N~ 400V 50Hz)

Items	Specifications
Model	ALFB-16830-2FB
Rated current	AC 415V 27A
Permissible temperature range	-20ºC to 85ºC
General dimensions	
Circuit diagram	

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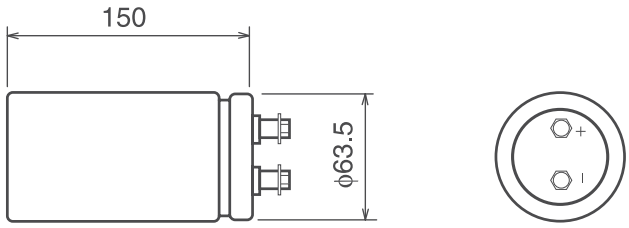
10.6. Capacitor (CB1, CB2)

This part is used for changing the alternative current to the direct current for the inverter. Connect two capacitor in line and used.

RASC-10HRNE (3N~ 400V 50Hz)

Items	Specifications
Models	LNX2G472MSEAHE
Capacity of static electricity	4700 μF
Rated voltage	400 VDC
Permissible temperature range	-25ºC to 95ºC

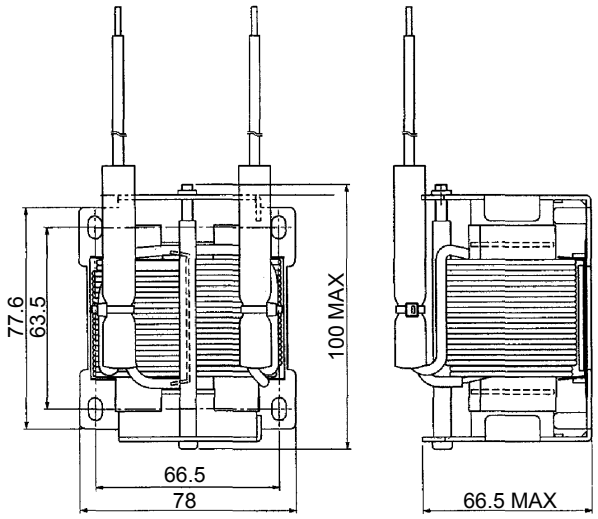


10.7. Reactor (DCL)

This part is used for changing the alternative current to the direct current for the inverter.

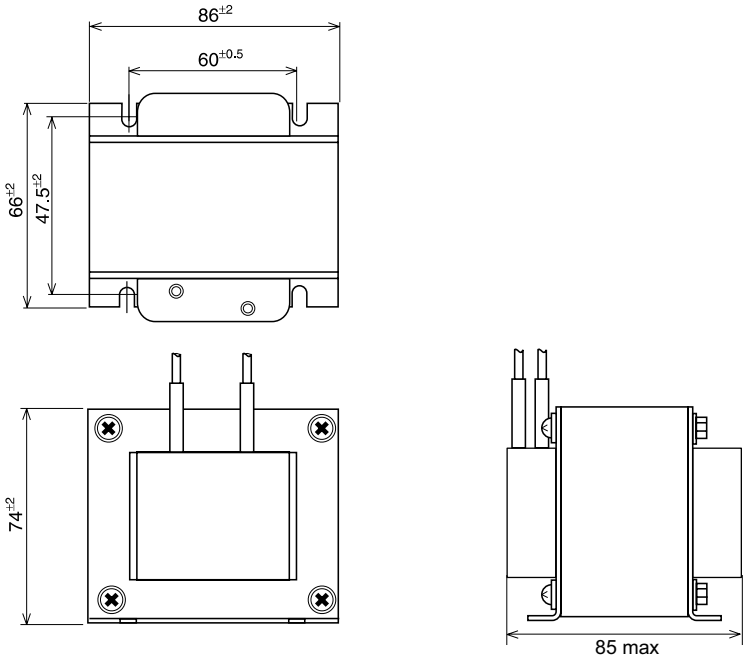
RASC-(3/5)HVRNE (1~ 230V 50Hz)

Items	Specifications
Characteristics	0.68 mH+15% (at 1kHz)
Rated current	25 A
Direct resistance	31 mΩ
Permissible temperature range	-20ºC to 60ºC



RASC-10HRNE (3N~ 400V 50Hz)

Items	Specifications
Characteristics	1.0 mH+10% (at 1 kHz)
Rated current	30 A
Direct resistance	22.8 mΩ+20% (at 20ºC)
Permissible temperature range	-20ºC to 65ºC



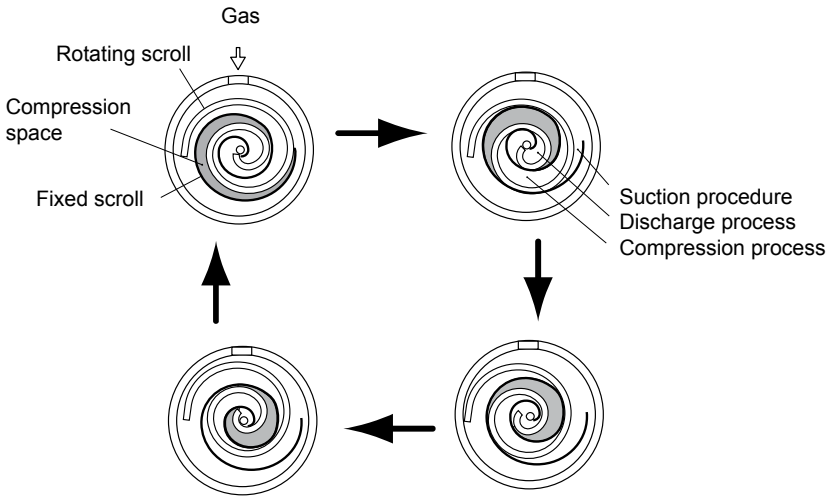
10.8. Scroll compressor

10.8.1. Reliable mechanism for low vibrating and low sound

1. The rotating direction is definite.
2. The pressure inside of the chamber is high pressure, and the surface temperature of the chamber is 60 °C to 110 °C.

10.8.2. Principle of compression

1. The gas is inhaled from the inlet port at the outer frame of the fixed scroll.
2. The gas inside of the compression space is compressed toward the center of the scroll.
3. The compression space is minimum at the center of the scroll, and the gas compressed at the maximum is discharged from the outlet port of at the center of the scroll.
4. The above procedures (suction compression discharge) is repeated continuously.



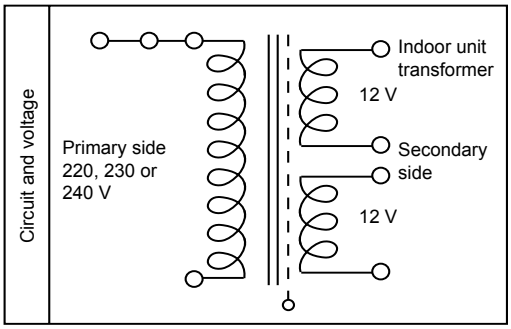
11. Field Work Instruction

Contents

11. Field work instruction 255
11.1. Checking the power source and the wiring connection 256
11.2. Burnt-out compressor due to an insufficient refrigerant charge 256
11.3. Insufficient cooling performance when a long piping is applied 257
11.4. Abnormally high operation sound (in-the-ceiling type indoor unit) 257
11.5. Alarm code "31" 258
11.6. Not well cooling due to insufficient installation space for outdoor unit or inlet/outlet air bypass 258
11.7. Caution in case of refrigerant leakage 258
11.7.1. Maximum permitted concentration of HFCs 258
11.7.2. Calculation of refrigerant concentration 259
11.7.3. Countermeasure for refrigerant leakage 259
11.8. Maintenance work 260
11.9. Service and maintenance record 261
11.10. Service and maintenance record using the 7-segment display 262
11.11. Service and maintenance record by remote control switch 263
11.12. Pump-down method for replacing the compressor 264

11.1. Checking the power source and the wiring connection

Check the following items in the case of abnormal operation:

No.	Check item	Procedure
1	Is the breaker of the fuse cut out?	Check the secondary voltage of the breaker and the fuse by means of a tester.
2	Is the secondary power source on the transformer correct?	Disconnect the sedcondary side of the transformer and check the voltage by means of a tester. 
3	Is the wiring loosened or incorrectly connected?	Check the wiring connection on the PCB. – Thermistor connectors – Connector of the remote control cable – Connector of the transformer – Each connector in a high-voltage circuit Check the connectors according to the **electrical wiring** diagram.

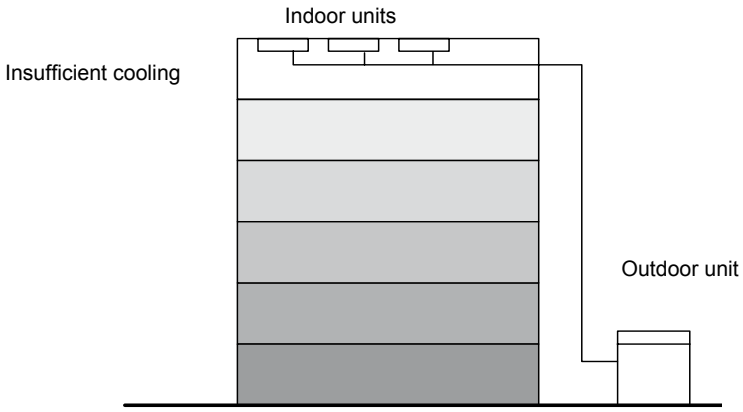
11.2. Burnt-out compressor due to an insufficient refrigerant charge

- **Question and answer for the field work**

Example 1: Burnt-out compressor due to an insufficient refrigerant charge	
Phenomenon	After commissioning, the alarm code "08" sometimes occurred and the compressors were burnt out after operating for two months.
Cause	The refrigerant piping work was performed during the summer season. The additional refrigerant was not sufficiently charged from the discharge gas side. This insufficient refrigerant charge resulted in the overheating of the discharge gas and the oil deterioration, which was finally due to the separated operation despite the alarm code "08".
Countermeasure	1. The compressor was replaced with a new compressor. 2. The correct refrigerant amount was charged according to the refrigerant piping length and the connected indoor units.
Remarks	Additional refrigerant charge: Open the liquid stop valves slightly when you charge the additional refrigerant from the check joint of the liquid stop valves (the discharge gas side) during the cooling process. If the liquid stop valve is fully open, it is difficult to charge the additional refrigerant. Do not charge the refrigerant from the gas stop valve.

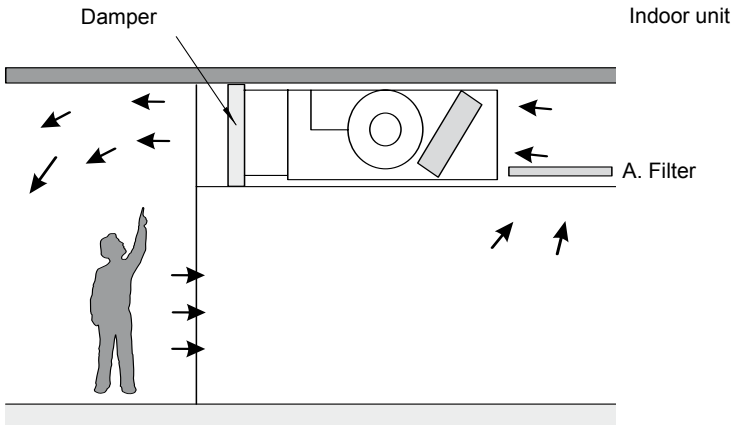
11.3. Insufficient cooling performance when a long piping is applied

- **Question and answer for the field work**

Example 2: Insufficient cooling performance when a long piping is applied	
Phenomenon	Sufficient cooling was not available for an indoor unit that was located at the farthest position.
Cause	If the location of an outdoor unit is 20 meters lower than the location of the indoor units, resetting of the DIP switch DSW3 is required. However, no setting was performed. Therefore, the largest discharge pressure was not increased. This resulted in an insufficient cooling performance for the indoor unit. 
Countermeasure	The setting of the DSW2 was changed.
Remarks	Pay special attention to the size of liquid pipe. Refer to "piping work in TC" for details

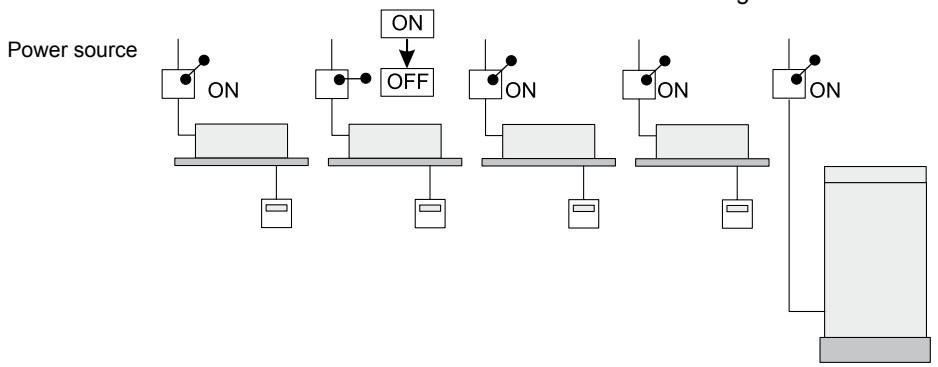
11.4. Abnormally high operation sound (in-the-ceiling type indoor unit)

- **Question and answer for the field work**

Example 3: Abnormally high operation sound (in-the-ceiling type indoor unit)	
Phenomenon	The operation sound at the "HIGH" speed was abnormally high.
Cause	The indoor units were installed without the ducts. Since there scarcely was any external static pressure, an abnormally big air volume was supplied. This resulted in a higher air speed through the heat exchanger 
Countermeasure	In order to reduce the airflow rate, a plate that is used as a damper at the discharge gas side was added.
Remarks	Note that the running current is increased when no external pressure is given to the indoor unit. This results in an overheating.

11.5. Alarm code "31"

- **Question and answer for the field work**

Example 4: Alarm code "31"	
Phenomenon	Alarm code "31" sometimes occurred and the system stopped.
Cause	The combination of the indoor units and the outdoor unit was the following. 
	This system was used in a tenant building. One of tenant's customers turned off the main switch for the indoor unit while other indoor units are running. This results in a different setting of the total indoor unit capacity in the same refrigerant cycle.
Countermeasure	All the main switches for the indoor units were always ON.

11.6. Not well cooling due to insufficient installation space for outdoor unit or inlet/outlet air bypass

- **Question and answer for the field work**

Example 5: Not cooling well due to insufficient installation space for outdoor unit or inlet/outlet air bypass	
Phenomenon	Cooling operation was well performed through the intermediate season. However, the cooling operation was not well available when the outdoor temperature was higher than 35°C.
Cause	Hot discharge air re-circulation. In this case, though the outdoor temperature was 35°C, the actual suction air temperature was nearly 50°C and protection system from excessively high suction pressure was activated, the frequency of the compressor was decreased and the cooling capacity was also decreased accordingly.
Countermeasure	Ensure that inlet and outlet is not bypassed (use grilles in opposite directions if necessary). Ensure that intlet and outlet air in opened spaces (never near walls).

11.7. Caution in case of refrigerant leakage

The installers and those responsible for drafting the specifications are obliged to comply with local safety codes and regulations in the case of refrigerant leakage.

11.7.1. Maximum permitted concentration of HFCs

The refrigerant R410A, charged in the RASC series system, is an incombustible and non-toxic gas. However, if leakage occurs and gas fills a room, it may cause suffocation.

The maximum permissible concentration of HFC gas, R410A in air is 0.44 kg/m³, according to EN378-1.

Therefore, some effective measure must be taken to lower the R410A concentration in air below 0.44 kg/ m³, in case of leakage.

11.7.2. Calculation of refrigerant concentration

1. Calculate the total quantity of refrigerant R (kg) charged in the system by connecting all the indoor units in the rooms to be air-conditioned.

2. Calculate the room volume V (m³) of each room.

3. Calculate the refrigerant concentration C (kg/m³) of the room according to the following equation:

$$\frac{R}{V} = C$$

R: Total quantity of refrigerant charged (kg)
V: Room volume (m³)
C: Refrigerant concentration (=0.44* kg/m³ for R410A)

11.7.3. Countermeasure for refrigerant leakage

The facility must have the following features in case of a refrigerant leakage occurs:

1. Provide a shutterless opening which will allow fresh air to circulate into the room.

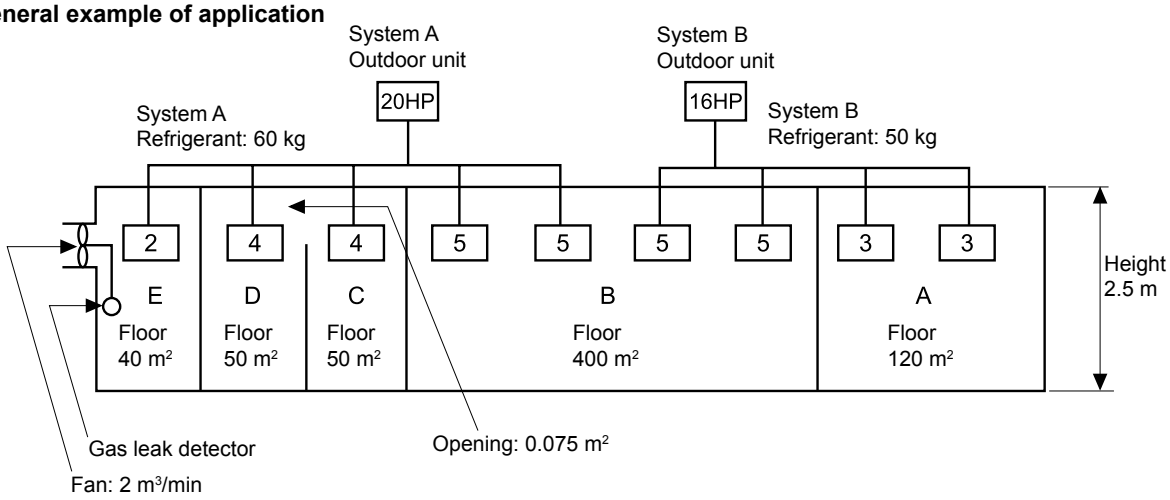
2. Provide a doorless opening of 0.15% or more size to the floor area.

3. There must be a ventilator fan connected to a gas leak detector, with a ventilator capacity of 0.4 m³/min or higher per Japanese refrigeration ton (= compressor displacement volume/5.7m³/h) of the air conditioning system using the refrigerant.

Model	Tonnes
RASC-3HVRNE	1.67
RASC-5HVRNE	2.27
RASC-10HRNE	4.11

4. Pay a special attention to the place, such as a basement, etc., where refrigerant can stay, since refrigerant is heavier than air.

- **General example of application**



Room	R (kg)	V (m^3)	C (kg/m^3)	Countermeasure
A	50	300	0.17	-
B	110	1,000	0.11	-
C	60	125	0.48	0.075 m^2 opening
D	60	125	0.48	0.075 m^2 opening
C + D	60	350	0.17	-
E	60	100	0.6	2 m^3/min. fan linked with gas leak detector

11.8. Maintenance work

- **For the indoor unit and outdoor unit**
  1. Fan and fan motor
     - Lubrication: All the fan motors are prelubricated and sealed at the factory. Therefore, no lubrication maintenance is required.
     - Sound and vibration: Check for abnormal sounds and vibrations.
     - Rotation: Check the clockwise rotation and the rotating speed.
     - Insulation: Check the electrical insulation resistance.
  2. Heat exchanger
     - Clog: Inspect the heat exchanger at regular intervals and remove any accumulated dirt and any accumulated dust from the heat exchanger. You should also remove from the outdoor units other obstacles, such as the growing grass and the pieces of paper, which might restrict the airflow.
  3. Piping connection
     - Leakage: Check for the refrigerant leakage at the piping connection.
  4. Cabinet
     - Stain and lubrication: Check for any stain and any lubrication. Remove the stain and the lubrication.
     - Fixing screw: Check for any loosened screw or any lost screw. Fix the loosened screws and the lost screws. Insulation material: Check for any peeled thermal insulator on the cabinet. Repair the thermal insulator.
  5. Electrical equipment
     - Activation: Check for an abnormal activation of the magnetic contactor, the auxiliary relay, the PCB and others.
     - Line condition: Pay attention to the working voltage, the working amperage and the working phase balance. Check for any faulty contact that is caused by the loosened terminal connections, the oxidized contacts, the foreign matter, and other items. Check the electrical insulation resistance.
  6. Control device and protection device
     - Setting: Do not readjust the setting in the field unless the setting is maintained at a point that is different from the point listed in the section 4: Safety and control device of “SM”

- **For Outdoor unit**
  1. Compressor
     - Sound and vibration: Check for abnormal sounds and vibrations.
     - Activation: Check that the voltage drop of the power supply line is within 15% at the start and within 2% during the operation.
  2. Reverse valve
     - Activation: Check for any abnormal activation sound.
  3. Strainer
     - Clog: Check that there is no temperature difference between both ends.
  4. Ground wire
     - Ground line: Check for the continuity to earth.
  5. Oil heater
     - Activation: You should activate the oil heater at least twelve hours before the start-up by turning ON the main switch.

11.9. Service and maintenance record

No.	Check item	Action	Judgement	
1	Is the service area sufficient?		Yes	No
2	Is there a short circuit of the discharged air?		Yes	No
3	Any heat influence?		Yes	No
4	Is the ground wire connected?		Yes	No
5	Refrigerant piping		Good	Not good
6	Fixing the units		Good	Not good
7	Is there any damage on the outer surface or the internal surface?		Yes	No
8	Checking the screw and the bolts	Tighten if loosened.	Tightened	Not tightened
9	Tightening the terminal screws	Tighten all the terminal screws with a Phillips screwdriver.	Tightened	Not tightened
10	Are the compressor terminals tightly fixed?	Push all the terminals.	Pushed	Not pushed
11	Insulation resistance	Measure the insulation resistance with an insulation resistance meter. Comp. and fan motor: greater than 3MΩ Others: greater than 3MΩ	Good	Not good
12	Does the drain water flow smoothly?	Check the smooth flow by pouring some water.	Good	Not good
13	Check for a leakage in the compressor	Check for any leakage.	Good	Not good
14	Check for a leakage in the outdoor heat exchanger	ditto	Good	Not good
15	Check for a leakage in the indoor heat exchanger.	ditto	Good	Not good
16	Check for a leakage in the 4-way valve.	ditto	Good	Not good
17	Check for a leakage in the check valve.	ditto	Good	Not good
18	Check for a leakage in the accumulator	ditto	Good	Not good
19	Check for a leakage in the strainer	ditto	Good	Not good
20	Check for a leakage in the electronic expansion valve	ditto	Good	Not good
21	Check for a leakage in the piping	ditto	Good	Not good
22	Check the direction of the fans	By viewing the airflow volume	Good	Not good
23	Voltage among each phase	Higher than AC220V	Good	Not good
24	Vibration and sound	Check the fan, the compressor, the piping, and others.	Good	Not good
25	Activation of each operation mode	Check the activation of the COOL switch, the HEAT switch, the STOP switch and the TEMP switch.	Good	Not good
26	High-pressure cut-out switch	Check the actual activation value.	Good	Not good
27	Check the activation of the drain-up mechanism.	Check the activation during the cooling process.	Good	Not good
28	Air inlet temperature of the indoor unit DB/WB		(°C)DB	(°C)WB
29	Air outlet temperature of the indoor unit DB/WB		(°C)DB	(°C)WB
30	Air inlet temperature of the outdoor unit DB/WB		(°C)DB	(°C)WB
31	Air outlet temperature of the outdoor unit DB/WB		(°C)DB	(°C)WB
32	High-pressure switch		kg/cm²G	
33	Low-pressure switch		kg/cm²G	
34	Operating voltage		V	
35	Operating current		A	
36	Instructions to the client for cleaning the air filter		Done	Not yet
37	Instructions to the client about the cleaning method		Done	Not yet
38	Instructions to the client about the operation		Done	Not yet

11.10. Service and maintenance record using the 7-segment display

Data sheet for checking by 7-segment display

Customer's name:_____ Date:_____

Outdoor unit model (serial no.)		RASC- (Serial no.)				RASC- (Serial no.)			
(1) Operation mode									
(2) Test run start time									
(3) Data collect start time									
(4) Read out data from 7-segment in Outdoor unit									
Protection control code									
Total capacity of I.U connected	CP								
Input/output state of Outdoor micro-computer	SC	52C	FAN1	FAN2	20A	52C	FAN1	FAN2	20A
		20F	21	CH	PSH	20F	21	CH	PSH
Alarm code for abnormal stoppage of compressor	AC								
Inverter order frequency to compressor	H1								
Indoor order frequency to compressor	H2								
Air flow ratio	Fo								
O.U. expansion valve opening	Eo								
Temp. at the top of compressor	Td								
Evaporating temp. at heating	TE								
Ambient air temp.	To								
Cause of stoppage at inverter	iT								
Inverter secondary current	A2								
O.U. address	nA								
Indoor unit (unit no. 1)									
I.U. expansion valve opening	EA								
Liquid pipe temp. of I.U. (Freeze protection)	LA								
I.U. intake air temp.	iA								
I.U. discharge air temp.	oA								
Cause of I.U. stoppage	dA								
Indoor unit (unit no. 2)									
I.U. expansion valve opening	EA								
Liquid pipe temp of I.U. (Freeze protection)	LA								
I.U. intake air temp.	iA								
I.U. discharge air temp.	oA								
Cause of I.U. stoppage	dA								
Indoor unit (unit no. 3)									
I.U. expansion valve opening	EA								
Liquid pipe temp. of I.U. (Freeze protection)	LA								
I.U. intake air temp.	iA								
I.U. discharge air temp.	oA								
Cause of I.U. stoppage	dA								
Indoor unit (unit no. 4)									
I.U. expansion valve opening	EA								
Liquid pipe temp. of I.U. (Freeze protection)	LA								
I.U. intake air temp.	iA								
I.U. discharge air temp.	oA								
Cause of I.U. stoppage	dA								

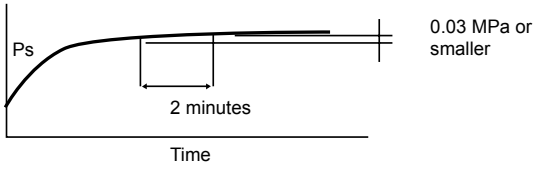
O.U.: Outdoor unit, I.U: Indoor unit
FAN1,FAN2: Constant speed fan, 52C: CMC, PSH: High pressure switch
20A: Solenoid valve (SVA), 20F: Solenoid valve (SVF), 21: Reversing valve (RVR), CH: Oil heater
*: Multiply 1/8 by the code on the 7-segment.

11.11. Service and maintenance record by remote control switch

Data sheet for checking by remote control switch

Time				:	:	:	:	:
I.U. model								
I.U. serial no.								
I.U. no. / alarm code								
		Check mode 1	Check mode 2	1 · 2	1 · 2	1 · 2	1 · 2	1 · 2
B Temp. indication								
	Set temp.	b1	- -					
	Inlet air temp.	b2	91					
	Discharge air temp.	b3	92					
	Liquid pipe temp.	b4	93					
	Remote thermistor temp.	b5	- -					
	Outdoor air temp.	b6	94					
	Gas pipe temp.	b7	95					
	Evaporating temp.at heating	b8	96					
	Control information	b9	97					
	Comp. top temp.	bA	98					
	Thermo temp. of remote control switch	bb	- -					
C Micro-computer state indication								
	I.U. micro-computer	C1	- -					
	O.U. micro-computer	C2	- -					
D Stopping cause state indication								
	Stopping cause state indication	d1	- -					
E Alarm occurrence								
	Times of abnormality	E1	- -					
	Times of power failure	E2	- -					
	Times of abnormal transmitting E3	- -						
	Times of inverter tripping	E4	- -					
F Automatic louver state								
	Louver sensor state	F1	- -					
H Pressure, frequency state indication								
	Discharge pressure	H1	99					
	Suction pressure	H2	9A					
	Control information	H3	9b					
	Operating frequency	H4	9C					
J I.U. capacity Indication								
	I.U. capacity (1/8HP)	J1	- -					
	O.U. code	J2	- -					
	Refrigerant cycle number	J3	- -					
	Refrigerant cycle number	J4	- -					
L Opening of ex. valve								
	I.U. ex. valve	L1	9d					
	O.U. ex. valve 1	L2	9E					
	O.U. ex. valve 2	L3	- -					
	O.U. ex. valve B	L4	- -					
P Running current indication (reference)								
	Comp. current	P1	9F					

11.12. Pump-down method for replacing the compressor

No.	Procedure	Remarks
1	Turn off the main switch of the outdoor unit.	
2	Remove the covers, the thermistor, the crankcase heater, the power wirings, and other items according to the chapter "removing the parts of the oudoor unit".	Make sure that the terminal part of the detached power supply wires is not exposed by the winding insulation tape and other items.
3	Attach the manifold to the check joint of the high-pressure side and the low-pressure side of the outdoor unit.	
4	Turn on the main switch of the outdoor unit.	
5	Set the exclusion of the compressor by setting the DSW so that a broken compressor will not work. You can set the exclusion of the compressor by setting the DSW1-4 in ON position.	
6	The compressor replacing mode is performed: – The DSW1-4 on the outdoor unit PCB→ ON (The cooling is run).	– This operation is performed for up to a maximum of ten minutes. – If the inverter compressor is excluded, the operation starts after three minutes.
7	The operation finishes when one of the following conditions occurs: 1) Ten minutes have passed and STP is displayed in seven segments. 2) "08" is displayed in seven segments. 3) When Ps< 0.1MPa is continued for one minute, in ten minutes STP is displayed in seven seconds and the operation finishes.	– The operation may finished when any of the conditions 1) to 3) occurs.
8	Close the liquid stop valve completely.	To avoid the spillage of all the refrigerant if the check valve is broken.
9	Check for a leakage of the check valve on the discharge gas side: – DSW4-4 (enforced stoppage of the compressor) → ON, so that the compressor will not run although the running command is sent from the remote control switch. – Check that variation of Ps on the outdoor unit PCB is 17 seconds. Make sure that the Ps increase is within 0.03 Mpa in two minutes after the Ps increase at the stoppage (during approximately five minutes). Also make sure that Pd>Ps.  	– When you stop the compressor for replacing: – You can check the leakage of the check valve by means of the Ps variation because the SVA opens so that the discharge gas side of the inverter compressor can connect to the low-pressure side. – 0.03 Mpa / 2 minutes is within the permissible limits for the check valve on the discharge gas side. – The leakage of the check valve may cause an incorrect brazing, due to the gas pressure at the brazing of the discharge piping. – If the compressor-replacing mode is performed again, set the DSW4-4 to OFF and keep the DSW4-4 at the OFF side during ten minutes. Then, start according to the procedure No. 6.
10	Collect the refrigerant by means of the refrigerant collection: – Perform either A or B, depending on the process 10. A: The leak rate at the process 10 is within the specification → Collect the refrigerant only at the low-pressure side. B: The leak rate at the process 10 is greater than the specification → Collect all the refrigerant of the outdoor unit side by means of the machine.	– The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by the collector. – Keep a note of the quantity of the collected refrigerant.

No.	Procedure	Remarks
11	After collecting the refrigerant, remove the change hose (collector side) of the low-pressure side, so that the low-pressure side of the refrigerant cycle will be the atmosphere pressure.	– Make sure that there is no pressure increase of the low-pressure sides after collecting the refrigerant. – Make sure that the refrigerant cycle is the atmosphere pressure. Otherwise, problems such as the blowing of gas and the suction of the cutting material) may occur when you are removing the compressors.
12	Turn OFF the main switch of the outdoor unit.	
13	Perform the replacement of the compressor and the change of the refrigerant oil according to the section "replacing the compressor".	Make sure that you follow the instructions.
14	Perform the vacuum from the check joint of the low-pressure side.	If you collect the refrigerant only on the low-pressure side (**A** in 11). You cannot perform the vacuum of the refrigerant from the check joint of the high-pressure side.
15	Open the liquid stop valve and the gas stop valve completely when you finish the vacuum.	
16	Make sure that the power is turned OFF and attach the following items: the power supply wire, the thermistor, the crankcase heater, the 63H wiring, the panel and the nut).	
17	Set the DSW back to the original setting. Make sure that all the wirings to the compressor are connected correctly.	
18	Recharge the refrigerant that is collected in the process by the stop valve of the liquid side during the cooling at the TEST RUN mode.	If the replacement of the compressor takes more than two hours, an additional change of the refrigerant is necessary. Additional change = (replacing time – 2 hours) x 0.5kg.

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